

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

BOUVERIE HOUSE, 154, FLEET STREET, LONDON, E.C.4

Telegrams : ALLANGAS FLEET LONDON

GLASGOW : 116, Hope Street (Central 3970)

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Blacking-Out Factories

NOT least among the war-time problems with which the chemical industry has been faced—and, indeed every industry depending for its existence on extensive industrial premises—is the question of the black-out and its accompanying effects on personnel. For the first time for many years, the *immediate* well-being of the employee is not the prime consideration of factory equipment; what has to be considered first and foremost is his safety in case of war-time emergency, and, unfortunately, in such cases safety first does not necessarily mean comfort first. At the same time it is obvious that under adverse working conditions not only the man, but also his work, will suffer, and from the moment the black-out was decreed, engineers, chemists and technicians of all kinds have spent their energies on devising a happy medium—a black-out without tears, in fact.

It is not altogether unexpected that official sanction should lag behind technical ingenuity, and many schemes that seemed fool-proof have been held up owing to the lack of permission from the authorities to make use of them. In these circumstances special interest lies in the discussion on the blacking-out of factories to comply with war-time lighting restrictions, which took place at a recent special meeting of the Chemical Engineering Group of the Society of Chemical Industry. It was there revealed that within the main problem of the darkening of industrial premises for defence purposes, other very important problems are met with, more far-reaching than the mere physical blacking-out.

Mr. H. W. Cremer, chairman of the Group, who presided, pointed out that serious troubles concerning ventilation of factories have been encountered through the necessity for closing all windows after dark, and said that what some people had regarded as psychological effects were in all probability physiological effects. During the discussion, an instance was mentioned in which the workers in certain classes of factories could not remain at work for more than two hours at a stretch after the black-out owing to the inefficient ventilation. Another matter stressed was the effect on the workers of having to carry out their work in artificial light far less bright than that to which they had become accustomed, but although some speakers spoke of a reduction in efficiency on

this account, others said that in their particular cases any effect of this sort remedied itself after the workers had been working in the reduced artificial lighting for a short period.

It is quite evident from the discussion that the general problem of ventilation of factories will come under review at some future date by the Group, and what was said to be a lack of knowledge on the subject has been brought into greater prominence by black-out conditions.

So far as the actual physical methods of blacking-out factories are concerned, Mr. L. W. Robson, of Nobel's Chemical Finishes, Ltd., strongly advocated the use of paint for all glass surfaces in preference to such other methods as temporary shuttering which is put up at night and removed in the daytime. The reasons he gave were that paint can be rapidly applied, it is cheap, and uniform artificial lighting conditions are obtained in a building both by day and night. The principal objection to the complete black-out with paint is the very considerable increase in the lighting bill. So far as the actual painting is concerned, it was urged that glass surfaces should be free from grease and that they should be painted on the inside to preserve the paint from the effects of water. There might be difficulties here, however, in process buildings where there is considerable condensation. Aluminium paint was suggested for vertical windows because it gives a bright appearance to the inside, but it must not be used for roof lights owing to the glint. Another material mentioned during the discussion for obliterating windows was high temperature tar treated with lime. This has been found to be strongly adherent and quite opaque.

Then there is the use of complementary lighting, the colours chosen usually being orange and blue. This system is based on well-known optical principles and entails the conversion of the windows to blue filters which will not pass orange light, and the use of lamps which give orange light free from any blue rays. The blue lacquer has been found to reduce illumination by 50 per cent., and this is a real objection. The use of luminous paints was also mentioned, especially for direction indicators and the marking of doorways.

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NOTES AND COMMENTS

Anti-Knock Compounds

IN an interesting article published in *Industrial and Engineering Chemistry* (Industrial Edition, Dec., 1939), Mr. Graham Edgar reviews the history of the use of tetraethyl lead as a motor spirit, and makes some pertinent suggestions concerning the future. He notes that there appears to be a feeling in certain quarters that the internal combustion engine cannot efficiently utilise fuels that are appreciably higher in anti-knock value than those available to-day. In fact, testimony was recently presented to the Temporary National Economic Committee in Washington to the effect that the motor of to-day has reached the top in high compression ratio so that there is no need for improving motor spirit quality further! Such arguments may be easily confuted by examining the facts in the case. In considering the fuel of the future, we must consider the automobile of the future, and although no one would be rash enough to make an exact prediction, enough data already exist to show that a number of ways exist in which fuel of very high anti-knock value may be efficiently utilised. For example, by increasing the compression ratio, advantage can still be taken of increased fuel quality, and this trend, though not one which can be followed indefinitely, may be the main line of development in the future.

The Fuel of the Future

NO answer can yet be given to the question: "What will the fuel of the future be?" Amazing progress has been made and is being made by the petroleum industry in modifying the structure of hydrocarbons to produce motor spirit of high anti-knock value. Cracking and reforming, both thermal and catalytic, coupled with isomerisation, alkylation, polymerisation, aromatisation, etc., are developing rapidly, and are increasing both yield and quality of fuel. The very magnitude of the petroleum industry makes such developments gradual. No matter how valuable a new refining process may be, considerable time must elapse before it can play a substantial part in the industry. Mr. Edgar visualises a gradual development of the refining art, with a corresponding gradual increase in the quality of the marketed products, and

with no apparent limit on this quality. A corresponding gradual increase in the efficiency of the motor engine may likewise be expected. As to the part that tetraethyl lead and other anti-knock compounds will play in this development (since some mixtures of lead alkyls are already known which possess advantages over tetraethyl lead), the writer believes that these compounds will continue to play much the same part in the future that they have in the past.

Russian Oil Production

MUCH speculation has recently centred on the extent to which Russia can meet Germany's requirements of oil in wartime. The following analysis of the position by a Russian authority (F. Kasakov, in *L'Actualité Chimique Moderne*, October, 1939) will consequently be of interest. Crude oil output for 1938, the latest year for which even approximate figures are available, is estimated to have been slightly over 30 million tons, of which all but 2 millions was reserved for internal use. Bearing in mind that the growing industrialisation of the country is accompanied by an expanding demand for petrol on the home market, it will be realised that any substantial surplus for export can be secured only as a result of considerable increase in production at the wells. Moreover, in order to attain this output it will be necessary not merely to intensify production at existing wells, but to open up wells in hitherto undeveloped regions and to establish many new cracking plants. It is doubtful, however, whether Russian equipment and personnel will be equal to this task, and there still remains the problem of transport to Germany. Finally, if it is remembered that Russian oil exports dropped from 6 million tons in 1932 to less than 2 million tons in 1938, the conclusion must be reached that very great obstacles stand in the way of any decisive assistance being rendered to Germany.

Hydrogenation of Furfural

EXHAUSTIVE study of the products of hydrogenation of furfural in presence of various metallic catalysts has been made by Natta, Rigamonti and Beati (*La Chimica e L'Industria*, November, 1939, p. 641). Previous work in this field, it is pointed out, has been practically limited to the production of furfuryl alcohol and tetrahydrofurfuryl alcohol. E.P. 388,703, of Boehme A.G., covers the pressure hydrogenation of furfural to tetrahydrofurfuryl alcohol in presence of nickel formed by depositing nickel hydroxide on kieselguhr and reducing in a stream of hydrogen. The Italian workers now find that good yields of this alcohol are also obtained when using reduced nickel chromate. In reductions with nickel the furane ring generally remains intact, whereas hydrogenation in presence of cobalt and copper leads to simultaneous rupture of the furane ring with formation of aliphatic compounds. A new route to amyl alcohol is thus provided by hydrogenation of furfural with an 80:20 mixture of cobalt and nickel (prepared by reduction of the mixed hydroxides). Copper chromite is also a specific catalyst for rupture of the furane ring, among the products prepared with its aid being 1,4-amylene glycol. The effect of an iron catalyst is of interest in that good yields of methyl furane are got with an 80:20 mixture of iron and nickel prepared by reduction of the mixed hydroxides. Methyl furane, it may be noted, has also been hydrogenated in turn to tetrahydro-methyl furane in presence of reduced nickel (F.P. 811,695, of Usines de Melle and H. M. E. Guinot) and this derivative is readily converted into piperylene (1,3-pentadiene) which forms a rubber-like polymeride.

PYRITES ROASTING AND SULPHUR BURNING

Recent Developments Meriting War-time Attention

By

C. H. BUTCHER

EXTENDED utilisation of sulphur in industry operating under war conditions is directing attention to the attaining of greater efficiency in the roasting of pyrites and the burning of sulphur (as brimstone) for production of sulphur dioxide. The major industries affected, of course, are the sulphuric acid industry and paper making. An examination of technical and patent literature upon this subject shows that it has been kept well in hand during the past seven or eight years, and that a notably large amount of original work has been done in the U.S.S.R. and Canada.

Pyrites used for the production of sulphur dioxide is expected to contain as much as 42 per cent. of sulphur, but material of lower grade is often employed, as process and material can be suitably adjusted to determine the extent of the objectionability of any volatile impurities which may be produced. For instance, the resulting ferric oxide, under certain conditions, may act as a catalyst to promote the combination of sulphur dioxide and oxygen, so that 2 to 5 per cent. of the dioxide is converted to trioxide. The presence of trioxide is a disadvantage in the sulphite process of paper making and also in the manufacture of sulphuric acid by the contact process, but it is a slight advantage in the lead chamber sulphuric acid process. The pyrites may be roasted or burned in the form of lumps, but it is the more common practice to crush it to relatively small size or "fines" and carry out the burning process in a multiple-hearth mechanical furnace of the Herreshoff type. This furnace is essentially a vertical cylindrical shell of firebrick sheathed in steel, in which there are a series of hearths superimposed one above the other. Air-cooled radial arms, worked from a central shaft and provided with rakers or rabbles, keep the pyrites moving from upper to lower hearth in a slow continuous process, and, by the time the last hearth is reached, the removal of the sulphur as dioxide is practically complete. Rotary furnaces of the cement kiln type are also used.

In the Freeman process—used more especially for pyrites separated by flotation—"flash" roasting is applied. The wet pyrites is first dried in a ball mill by heated air, which continuously sweeps the dry powder into a vertical burner. Here the first atom of sulphur in the pyrites (FeS_2) is driven off and burned to SO_2 , and as the residual FeS falls through the air feed at the base of the combustion chamber it is burned to Fe_2O_3 with production of a further quantity of SO_2 . The high temperature which is employed in flash roasting minimises the formation of sulphur trioxide, and the residual iron oxide of pinhead size and of a high degree of purity becomes a valuable source of iron.

Types of Sulphur Burner

As an alternative to pyrites, crude sulphur or brimstone can be used as raw material for producing sulphur dioxide; the resulting gaseous product is generally of much higher purity than that obtained from the roasting of pyrites. In the case of pyrites the presence of metallic fumes or other impurities may make further treatment necessary before the gas can be used in acid manufacture. Sulphur burners of various types are in use, ranging from the pan and tray type to those of the spray type. In one plant the sulphur may be fed from an open hopper into a horizontal rotating cylinder, where it is easily melted by the heat of combustion and a large burning surface is provided by the internal surface of the revolving shell of the cylinder. Here dampers are provided to regulate the supply of air, and the gaseous product carrying a certain amount of sublimed sulphur finally passes into a separate vertical combustion chamber where combustion is completed. In another plant molten sulphur is allowed to run into a

vertical steel cylinder lined with firebrick, and is there burned with clean dry air as it flows over the internal arch-like construction. As an alternative, molten sulphur can be sprayed into a suitable combustion chamber by means of compressed air, in much the same manner as a fuel oil, the heat of combustion being utilised to maintain a continuous supply of sulphur in the molten state. Gases from burners and roasters of the different types mentioned carry a considerable quantity of heat and where this heat is not needed for sulphur melting it is utilised for steam raising.

Some General Patents

Zeisberg, in a patent assigned to E. I. du Pont de Nemours and Co. (U.S. Pat. 2,086,201 of 1937), produces sulphur dioxide and molten iron oxide by suspending pyrites fines in preheated air in a combustion zone where the pyrites is caused to combine with the oxygen. The gases are withdrawn from the combustion zone and passed in heat exchange relationship with air to preheat the latter for use in the process. Oxidising conditions are maintained throughout the combustion zone, with the temperature above 1500 deg. C. and above the melting point of the iron oxide which is then collected in the molten state. In another patent, assigned to the General Chemical Co., MacDonald (U.S. Pat. 2,086,232 of 1937) introduces pyrites into a combustion zone where it is burned in gaseous suspension to produce highly heated sulphur dioxide gases, a solid metal oxide cinder and dust. Maintained at the relatively high combustion temperature the gases are then passed through a long dust-separating zone, where supplementary oxidising gas is introduced to aid the combustion of residual sulphur in the cinder and dust. The gases are finally cooled to about 260-315 deg. C., while flowing vertically to reduce volume and velocity and so deposit cinder and dust.

Mullen, in a patent assigned to the General Chemical Co. (U.S. Pat. 2,108,592 of 1937), describes a process for roasting "coarse" sulphide ores and sulphide "fines." The fines, introduced into a combustion zone in the form of a suspension in oxidising gas, are completely roasted to produce sulphur dioxide and create a high temperature, while the coarse ore is roasted in a bed under the influence of the high temperature developed by the suspension roasting of the fines—also producing sulphur dioxide.

Tyrer, in a patent assigned to Imperial Chemical Industries, Ltd. (U.S. Pat. 2,031,801 of 1936), passes the pyrites through a distillation zone and a combustion zone, countercurrent to the gas stream formed by introducing a restricted quantity of gas containing free oxygen and a proportion of a preheated sulphur-dioxide-bearing gas, so adapted that the gases around the top of the combustion zone are substantially free from oxygen and have a sulphur dioxide content of at least 20 per cent. Imperial Chemical Industries, Ltd. (Fr. Pat. 718,727 of 1931), refer to the roasting of pyrites in air in a rotary mechanical or shaft furnace, the temperature of the combustion zone being regulated to 800-1000 deg. C. by the introduction of a relatively cold gas composed of sulphur dioxide and nitrogen. In another patent of Imperial Chemical Industries, Ltd. (Fr. Pat. 744,187 of 1933), the gases leaving the furnace—carrying free sulphur, sulphur dioxide and nitrogen—are treated to remove the free sulphur, and the residual gas is enriched in sulphur dioxide and recirculated so as to maintain a concentration of at least 20 per cent. sulphur dioxide in the upper part of the combustion zone.

According to Lepsoe and Kirkpatrick (Trans. Canadian Inst. Mining Met., 1937, 40, 399) the flash roasting of zinc concentrates by the Consolidated Mining and Smelting Co., of Canada, at Trail, B.C., gives an 80 per cent. sulphur dioxide gas suitable for sulphuric acid manufacture. Freeman

(Chem. Met. Eng., 1937, 44, 311) has reported the successful development of flash roasting applied to pyrites concentrates at the St. Lawrence Paper Mills, Three Rivers, Quebec, where a plant is in operation dealing with 24 tons of concentrates per day; see also a paper by Jentz (Pulp Paper Mag. Canada, 1935, 30, 61, 104). Milliken (Mining and Met., 1937, 18, 279) has described three typical flash-roasting installations. At the works of the Canada Power and Paper Corporation, where pyrites is burned for production of sulphur dioxide for paper making, it is stated that the gas from the Freeman roasters contains 11 to 13 per cent. SO_2 , which gives an acid of correct strength for the sulphite process. An average of 1.45 lb. of steam at 115 lb. pressure per lb. of pyrites is obtained in cooling the gases. The residual calcine, with 65 per cent. of iron, assays only 0.3 per cent. sulphur.

Freeman (Pulp Paper Mag. Canada, 1932, 32, 167) deals with the flash roasting of pyrites in the form of flotation concentrate containing at least 50 per cent. sulphur. The plant consists of a feed hopper, a ball mill in which the concentrate is brought into suspension in air, and fans and pipes to inject the mixture into the specially designed combustion chamber where a temperature of 1150 deg. C. is attained. The gases are cooled rapidly to 250 deg. C. in a water-tube steam boiler, and finally brought down to atmospheric temperature, and are then washed in a tile-packed tower to remove impurities and dust. Abel (Nor. Pat. 48,606 of 1930) describes a process in which finely-ground pyrites is suspended in the air necessary for combustion, the suspension being heated to 600-800 deg. C. before leaving the nozzle in the combustion chamber.

Rotary and Multiple-Hearth Furnaces

A rotary drum furnace for completely roasting sulphide ores has been patented by the Metallgesellschaft A.G. (Ger. Pat. 632,830 of 1936). Among other recent patents are Kopylov and Kristin for a circular pyrites burner (Russ. Pat. 36,643 of 1934); Rhodin (U.S. Pat. 2,031,504 of 1936); Bettison and Ely, a multiple-hearth furnace for pyrites (Brit. Pat. 354,473 of 1930); Saladin, a furnace with superimposed hearths (Brit. Pat. 350,086 of 1930); Soc. Nouvelle des Etablissements Alfred Maguin (Fr. Pat. 706,515); and Hechenbleikner (U.S. Pat. 1,923,866). A rotary tube furnace for pyrites has been described by Debuch in a patent assigned to the American Lurgi Corporation (U.S. Pat. 2,019,397 of 1936). In a rotary kiln, patented by the I. G. Farbenindustrie (Brit. Pat. 442,030 of 1936), the shell of the kiln is provided with devices by which the heat losses by transmission through the shell can be varied as desired in order to give temperature control over the roasting of the pyrites. Teatini (Brit. Pat. 461,665 of 1937) describes a sulphur burner with alternating cooling boxes and hearths fed with molten sulphur, the air for combustion being supplied at the middle of each hearth and the sulphurous gases being removed around the periphery. The gases pass to a circular flue containing the tanks in which the sulphur is melted. The Società Generale Montecatini has published details of a furnace for the continuous combustion of sulphur (Fr. Pat. 828,014 of 1938).

Special Adaptations in Russia

Special adaptations of ovens for dealing with different grades of pyrites have been placed on record by Arkin (J. Chem. Ind., Moscow, 1933, No. 9, 59). Ovens for burning low-grade pyrites and other poor sulphur-bearing ores have been discussed by Medinskii and Balaban (J. Chem. Ind., Moscow, 1934, No. 8, 23). Dereshkevich (Khimstroï, 1933, 5, No. 2, 2645) deals with the subject of furnace linings with reference to the burning of pyrites. The details of a feeding device have been patented by Ageev (Russ. Pat. 35,540 of 1934); African Explosives and Industries, Ltd. (Brit. Pat. 354,022 of 1929), have also given attention to this matter, with special reference to the feeding of wet pyrites. Improvements in the construction and operation of devices for the mechanical removal of pyrites cinder from burners have been recorded by Baranov (Bumazhnaya Prom., 1935, 14, No. 7, 25), where an

experimental device for the removal and transport of the cinders by pneumatic means is described. The possibility of utilising the large quantities of cinder which have accumulated at sulphuric acid works in the U.S.S.R. has been considered by Maslennitskii (Gorno-Obogatitel'noe Delo, 1932, No. 4, 21), with stress on the fact that such cinder contains small amounts of copper in addition to the iron.

The subject of increasing the productivity of mechanical ovens for burning pyrites has been dealt with by Postnikov, Kunin and Baganov (J. Chem. Ind., U.S.S.R., 1937, 14, 276). Sandler and Andreiev (J. Chem. Ind., U.S.S.R., 1937, 14, 401) make some technico-economic comparisons of pyrites burners. Data for the intensive operation of mechanical furnaces has been placed on record by Malin, Symslov and Blyum (J. Chem. Ind., U.S.S.R., 1938, 15, No. 2, 12). Reference should also be made to a paper on performance data by R. and J. Moritz (Chaleur et Ind., 1938, 19, 359, 398), the burning of both pyrites and sulphur being considered. Particulars concerning the performance of the Yushkevich pyrites burning furnace were contributed by Vtorov to a series of papers on the technical reconstruction of the sulphuric acid and sulphur industry of the U.S.S.R. under the second five-year plan, published in Leningrad in 1934; see also Kuzminukh and Lyapustina (Bumazhnaya Prom., 1934, 13, No. 73) with special reference to flotation pyrites. The disclosure of considerable sulphur losses in the operation of roasting pyrites has been reported by Krasnoarmenskii and Komissarova (Leningrad Dist. Sci. Eng. Tech. Soc. Cellulose Paper Ind., 1934, 119).

Sulphur dioxide can be recovered from gases obtained in the roasting of pyrites by use of an aqueous solution containing one or more salts of non-volatile acids, according to a patent of Imperial Chemical Industries, Ltd. (Fr. Pat. 755,255 of 1933). It is stated that a solution of sodium citrate, with or without sodium or ammonium phosphate, or a salt of lactic or glycolic acid, may be used. A patent of the Metallgesellschaft A.G. (Ger. Pat. 601,067 of 1934) refers to the cooling of pyrites roaster gases from above 600 deg. C. to a temperature suitable for the manufacture of sulphuric acid by contact with crude phosphate or superphosphate. By this process the subsequent conversion of the crude phosphate to superphosphate is facilitated; if superphosphate is used its water-soluble P_2O_5 content is raised.

Jelincek (Chimie et Industrie, special issue, June, 1933, 725) gives a brief discussion of the troubles encountered in the roasting of pyrites which has suffered deterioration by exposure to atmospheric agents so that part of the sulphur has been converted into sulphates. He states that even 3.5 per cent. of sulphur as sulphate can interfere seriously with the normal operation of pyrites burners.

Elimination of Impurities

For burning carbonaceous pyrites in efficient manner, Bloshstein (Russ. Pat. 29,252 of 1932) suggests lowering the temperature of the furnace by adding gypsum or anhydrous calcium sulphate to the furnace charge. The inflammability of pyrites containing carbon is emphasised by Ruiss, Zhuravleva and Suslov (J. Chem. Ind., Moscow, 1935, 12, 606). Such pyrites has a lower ignition temperature than ordinary pyrites, ranging from 228 to 242 deg. C., and it is more explosive in air mixtures; as the particle size increases, however, the explosiveness of the mixture decreases. The extraction of sulphur from pyrites containing carbon, by burning in insufficient air with the simultaneous introduction of water vapour, has been discussed by Postnikov and Kirillov (J. Chem. Ind., Moscow, 1934, 9, 51). The best temperature for the reaction is said to be 800 deg. C.; below this the addition of water to the air passing through the plant improves the yield of sulphur, but above that temperature water has little effect except to slow down the rate of reaction. A high carbon content increases the percentage of sulphuretted hydrogen formed. Sulphur contaminated with organic material, such as tar, can be converted into sulphur dioxide by passing a heated gas containing oxygen into the molten material at a temperature high

enough for combustion to take place, according to the I. G. Farbenindustrie (Fr. Pat. 807,221 of 1937). Part of the sulphur, corresponding to the amount of oxygen present, is burned; the remainder is converted to sulphur dioxide by the addition of more oxygen, preferably in the presence of a catalyst.

The gaseous product from pyrites-roasting furnaces can be freed from arsenical impurities by the addition of alkali or alkaline earth chlorides on a zeolite base with calcium cation (Jeanprost and Maginot, Fr. Pat. 793,958 of 1936), or by washing in a series of vessels containing sulphuric acid (Metallgesellschaft A.G., Ger. Pat. 535,645 of 1930). Golyand and Shneerson (Russ. Pat. 41,507 of 1935) suggest avoiding the precipitation of both arsenic and sulphur compounds in sulphur-burner gases by a preliminary cooling to about 280-300 deg. C., and subsequent subjection to electrical precipitation. The gases are then passed through a cooler flushed with 30 per cent. sulphuric acid where the temperature is brought down to 100 deg. C., simultaneously obtaining sulphuric acid of a concentration of 62 to 70 per cent. The remaining arsenic compounds are removed in a second electrical filter. The utilisation of the arsenic obtained as a by-product in the roasting of pyrites is discussed, from point of view of the chemical industry, by Volodin (Trans. 6th Mendeleev Cong. Theoret. Appl. Chem., 1932, 2, pt. 1, 509).

Comparisons of Methods

A review of the development of sulphur-burning furnaces, with working conditions and results obtained from each type, has been made by Gatto (Congr. Internat. Mines Metal Geol. Appl., 7th Session, Paris, October, 1935, Mines, 1, 291). An earlier comparison of methods and equipment, dealing with the burning of sulphur and also pyrites, showing the superiority of the former over the latter in acid making for the paper industry, was made by Cooper (Paper Pulp Mag. Canada, 1931, 31, 1390). Factors affecting the efficiency of production of sulphur dioxide in sulphur burners were analysed by Aasen (Paper Trade J., 1932, 94, No. 15, 39), who states that the combustion should be carried out at a high temperature. As dictated by practice at sulphite paper mills, the gas is cooled down immediately to 200 deg. C., to prevent conversion of SO_2 and SO_3 , by water showers which are so regulated that the water leaves the cooler at a temperature of nearly 100 deg. C.

Browning and Kress (Paper Trade J., 1935, 100, No. 19, 31) have made a comparison of the spray type sulphur burner of the Texas Gulf Sulphur Co. with other burners, relative to SO_3 formation and the corrosive effect of SO_3 on heat-exchange equipment. The construction and operation of this burner, as installed at the paper mill of the Kimberley Clark Corporation, was reported by Kress, Swanson, Porter and Smith (Paper Trade J., 1934, 99, No. 17, 48). The high temperature of 2400 deg. F. and the high SO_2 concentration prevailing with this type of burner limits the maximum amount of SO_3 which can be formed to a value lower than the SO_2 content of burner gases often obtained with conventional types. In the operation of the latter the temperature range at which maximum SO_3 formation occurs in the presence of iron is passed while the burner is being brought to its maximum production, and also while it is being burned down; of this there is evidence in the surges of SO_3 that are found at intervals in the resulting sulphite cooking liquor. A brick-lined spray burner will produce gases of lower SO_3 content than the conventional type of burner made of iron, but there is no advantage obtained as regards SO_3 formation if iron is replaced by one of the alloy steels. Under certain operating conditions the iron pipe leading from the combustion chamber becomes brittle, due to the fact that iron at 1000 deg. C. completely reduces both SO_2 and SO_3 with formation of FeS and FeO .

Details of an atomiser for burning sulphur, in which concentric tubes provide separate passageways for the flow of gas and molten sulphur, with means for heating the sulphur and independent mechanism for cooling the atomiser, have

been given in a patent of Porter, assigned to the Texas Gulf Sulphur Co. (Can. Pat. 361,115 of 1936). Apparatus having a primary combustion chamber and several inter-connected pipe tees for the flow of gases has also been patented by Porter (Can. Pat. 366,062 of 1937). A spray burner giving 99.5 per cent. conversion of sulphur to sulphur dioxide and producing a gas containing 19 to 20 per cent. of sulphur dioxide, has been described by Bacon (Chem. Markets, 1932, 30, 261), the molten sulphur being fed by compressed air.

Judson (Brit. Pat. 394,539) refers to the heating of pyrites fines in suspension in a non-oxidising gas where volatile sulphur is distilled off, the remaining sulphide being roasted still further in suspension in an oxidising gas. The hot gases from the roasting process are used as the source of heat and also as the gaseous medium for the heating process in which the volatile sulphur is distilled. Lindblad (Swed. Pat. 76,748 of 1933) claims the roasting of pyrites in a rotary furnace in the presence of reducing agents with adjusted supply of air, so that part of the sulphur is driven off un-oxidised and is collected, while the iron and part of the sulphur, if desired, are oxidised.

Recovery of Elemental Sulphur

Bacon and Judson (Can. Pat. 339,298 of 1934) recover elemental sulphur from pyrites by suspending a finely divided mixture of pyrites and carbonaceous matter in a stream of hot gas containing sulphur dioxide, sulphur being distilled off, iron sulphide formed, and sulphur dioxide reduced to elemental sulphur. The resulting iron sulphide is passed into a counter-current stream of oxidising gas to produce sulphur dioxide. In a later patent (Can. Pat. 375,074 of 1938) Judson and Bacon obtain a substantially oxygen-free gaseous product containing sulphur dioxide from finely divided pyrites-bearing material, and this gaseous product, at a temperature of about 1000-1200 deg. C., is passed through a bed of incandescent coke to reduce the sulphur dioxide and form elemental sulphur in the stream of gas. The same joint inventors (Can. Pat. 375,075) modify this process by withdrawing the gaseous product at 1200 deg. C., cooling it to 1000 deg. and then passing it through a porous bed of pyrites and coke to effect the distillation of the volatile sulphur of the pyrites and the reduction of the sulphur dioxide, with ultimate production of a gas containing elemental sulphur and a solid residue of iron sulphide. The latter is ground to fine state and utilised in the oxidising operation.

FUNGUS GROWTH ON PAINTS

Fungus on paint films exposed to the weather has been found to play an important part in the breakdown of the films. The growth has been observed to be particularly extensive on red oxide paints during the monsoon months in India, says a report in *Science and Culture* (5, 5, Nov., 1939). The fungus is dark, practically black, and appears to produce fine pinholes in the paint film. In order to inhibit the growth of fungus, it is necessary to incorporate a suitable toxic substance. Paints were prepared containing small quantities of a number of toxic materials at the Industrial Research Branch of the Government Test House, Alipur, and the panels painted with them were exposed outdoors. Results indicate that certain of the substances which have proved efficacious in western countries for similar purposes, such as sodium silicofluoride, magnesium borate, and tribromophenol, are of very little value in Bengal, but mercuric oxide and mercuric phthalate appear to retard the growth of fungus perceptibly. The optimum concentration of these materials required to inhibit the growth altogether or to reduce it effectively still remains to be determined. The fungus has been identified as *Ascoidea rubescens* by Dr. S. R. Bose, Professor of Botany, Carmichael Medical College, Calcutta. Further information regarding the life and habits of the fungus requires to be gathered, and also whether this is the only type that grows on paints.

A Chemist's Bookshelf

THE QUALITY OF COKE, by R. A. Mott and H. V. Wheeler. London: Chapman and Hall. Pp. xxxv and 464. 36s.

This, the second Report of the Midland Coke Research Committee, published under the auspices of the Iron and Steel Industrial Council, more than sustains the high interest of the first report published in 1930 under the title of *Coke for Blast Furnaces*. The wider title is due to the wider interests of the coking industry. The appearance of the book suggests a reference volume, but we hope that it will not be treated as such. This is a record of work performed mainly by an academic staff into the fundamentals of coke production, and whilst everyone may not agree with some of the more theoretical ideas, it is for the practical men of the industry to study carefully, and implement where possible, the researches that have been conducted on their behalf. Valuable suggestions are made for a specification for coke, and we may hope that the major effect of this work will be first to improve the quality of coke for its various uses. The coke oven industry has a great future if it will put into practice the ideas that are being discovered or put forward on its behalf, and among those who provide these ideas, the Midland Coke Research Committee—now, alas, deprived by death of the services of Prof. Wheeler—stands high.

HYDROCARBON CHEMISTRY. A general discussion held by the Faraday Society in April, 1939, and published for the Society by Gurney and Jackson, London. Pp. 287. 12s. 6d.

IN THE CHEMICAL AGE of December 2, when commenting on a paper by Prof. Ipatieff, we pointed out the importance and the complexity of hydrocarbon chemistry. An excellent summary of scientific knowledge of this subject, blended with an indication of its commercial importance, is contained in this report which has just been issued. The concepts of physical chemistry have proved essential to the elucidation of the theory of the interactions of hydrocarbons, and sometimes it is found that technology has outrun pure science in that successful industrial processes are at work for which science has not yet been able to indicate the optimum conditions. There are still many divergent views upon the mechanism of the numerous reactions of the hydrocarbons and these papers are full of conflicting theories and their justifications, thus providing a vivid picture of chemistry in the making. As one example of this may be mentioned the mechanism of the homogeneous thermal reactions of the hydrocarbons; several different paths for each of these reactions are proposed, some involving the methyl radical and others the methylene radical. Perhaps this part of the discussion may be summed up by a remark from one of the papers: "The evidence which is in many ways confusing, involving as it does a number of conflicting experimental data. There is no doubt, however, that methylene (CH_2) has been isolated and exists as an intermediate in numerous reactions, but there seems no experimental proof that methylene contains bivalent carbon." A general conclusion for many thermal reactions is that several types of reaction, such as cracking to olefine and lower paraffins, decomposition to carbon and hydrogen, and the conversion of a paraffin simultaneously into a higher and a lower paraffin, are thermodynamically serious competitors to aromatisation, and are all characterised by the fact that a carbon-carbon bond must be broken. It is now desired to produce aromatic hydrocarbons synthetically from paraffins because of their superiority in anti-knock characteristics. The alternative paths, cracking and aromatisation, cannot, however, be controlled by shift of temperature, but the reaction must be directed by proper choice of catalysts; consequently several papers are devoted to the catalytic reactions of the hydrocarbons. Two papers are devoted to the technical synthesis of hydrocarbons by the Fischer-Tropsch process and one by coal hydrogenation; as a result a commencement has been made in understanding the steps in the mechanism of these reactions. A whole section

is devoted to problems arising from the combination of saturated hydrocarbons and olefines, a type of reaction of great importance for the production of fuels such as iso-octane and thus especially suited to producing aviation spirit from petroleum gases. The production of macro-molecules from hydrocarbons is also beginning to attract industrial interest; molecules of medium length are likely to be useful as synthetic lubricants, whilst the successful development of polymers for use in the plastic industries shows that here technology has far outstripped pure science. This is a publication of utmost value to all chemists interested in hydrocarbons, from whatever source they may be derived.

LUMINESCENCE. A general discussion held by the Faraday Society in Sept., 1938, and published for the Society by Gurney and Jackson, London. Pp. 240. 12s. 6d.

The well-known General Discussions of the Faraday Society hold a high place in the scientific world, and the Society was to be congratulated upon holding a meeting devoted wholly to the subject of luminescence, which, of course, includes both fluorescence and phosphorescence, and is becoming of industrial importance. The practical importance of the subject is due to the new electric signs which will one day re-appear in our streets, to the provision of "luminous" compounds for the darkened streets and buildings, and to television, for which luminescent solids are essential. The mercury vapour lamps establish both a requirement for luminescent materials as an intrinsic part of their design and a convenient source of ultra-violet radiation for the excitation of luminescence as in X-ray work, for example. The discussion recorded in the volume under review involved the luminescence of liquids and vapours, the luminescence of solids, and chemiluminescence. The papers provide a complete picture of the international scientific views upon the subject.

PRACTICAL MICROSCOPICAL METALLOGRAHY, by R. H. Greaves and H. Wrighton. London: Chapman and Hall. Pp. xi and 272. 18s.

This well-known standard work on the subject of the microscopical examination of metals—ferrous and non-ferrous—has now passed into a third edition. Some expansion and revision has been undertaken and a number of new photographs added. The excellence of the photographic reproductions is a feature of the book which reflects the highest credit on authors and publishers alike. The preparation of specimens is described and also the microscopical methods used for their examination. The structure of metals and alloys is lucidly treated by a combination of 21 constitutional and solubility diagrams and photographic plates of the structures described. The mechanical properties of metals are now being correlated with their microstructure, and the numerous defects to which commercial metals and their alloys are liable are almost invariably associated with abnormalities of structure; this book is mainly directed to elucidating this thesis, and remarkably well it succeeds in its object. The microscopical method is obviously well adapted to the examination of metallurgical problems, particularly when associated with pyrometric control. For that reason this work should be read by a much wider circle than that concerned wholly with metallurgy.

"THE NEW PAINT, VARNISH AND LACQUER CATECHISM," an interesting little booklet by G. B. Heckel, editor of the American journal *Drugs, Oils and Paints*, has just reached this country (Technical Service Library, 1s. 3d.). The booklet comprises terse and simple definitions of the materials, and of the uses of the products of the paint, varnish and lacquer industries, each of which is dealt with in separate sections by means of a system of questions and answers. G. B. Heckel is also the author of another booklet, "Why Paint Peels" (Technical Service Library, 1s.), which embodies "illustration, explanation, caution, and advice for painters, paint dealers, paint salesmen, architects and property owners."

New Control Orders

Copper Oxychloride and Sulphuric Acid

The Treasury have made an Order—Safeguarding of Industries (Exemption) No. 7 Order, 1939—under Section 10 (5) of the Finance Act, 1926, exempting copper oxychloride from key industry duty from December 20, 1939, until December 31, 1940.

The Control of Sulphuric Acid (No. 1) Order and the Direction No. 1 made thereunder, which come into force on January 1, provide that the production and sale of sulphuric acid shall be made subject to the direction of the Minister of Supply, and that the pre-war prices may be increased by from 12s. 6d. a ton to 17s. a ton according to strength, except in the case of battery or accumulator acid where the increase may not be more than 15 per cent. Licences are not required by buyers of sulphuric acid nor are they required by producers for their normal trade.

In pursuance of Regulations 55 and 98 of the Defence Regulations, 1939, the Minister of Supply has issued the Control of Non-Ferrous Metals (No. 5) Order, which came into force on December 18. This Order brings together in one document, with some amendments, the operative provisions of the four previous Non-Ferrous Metals Orders which are now repealed. The most important feature of the new Order is the new scale of maximum prices fixed for copper, lead and zinc.

Chemical Matters in Parliament

Producer-Gas-Driven Vehicles

In the House of Commons last week Mr. James Griffiths asked the Secretary for Mines whether he could make a statement indicating what progress had been made in the development of producer-gas-driven vehicles.

Mr. Lloyd replied that since his statement on November 8 last an announcement had been made that the design of conversion equipment evolved by the committee on the emergency conversion of motor vehicles to producer gas might be obtained from the Fuel Research Station of the Department of Scientific and Industrial Research by firms able and willing to undertake its manufacture. An announcement would also be made shortly by the Mining Association on behalf of the coal and carbonisation industries regarding fuel for gas-producers.

Mr. Griffiths: Have any applications been received so far?

Mr. Lloyd: Yes, Sir.

Government Research Departments

Captain Plugge asked the Prime Minister whether, in view of the need for talent in the reconstruction period after the war, he would instruct the different Departments to record and encourage any inventive or scientific ability capable of development in the national interest.

The Prime Minister replied that the civil departments concerned with research maintained in peace-time a close contact with universities, other institutions and private firms engaged in research. The research departments of the Service Departments, which had been much expanded for war purposes, were in close touch with outside bodies engaged on work bearing on their problems and had a close and satisfactory liaison with the civil research departments. Careful records were kept of any new ideas which could not be applied to an immediate war problem, but might be applicable to post-war needs. The records included details of the originators. In addition there was in the Central Register of the Ministry of Labour and National Service a very comprehensive record of men and women with scientific, technical and professional qualifications. All this material would be available when the problems of post-war reconstruction were considered. He did not think any new instructions were required.

Import and Export Regulations

Netherlands East Indies

H. M. Representative at Batavia has forwarded a translation of a statute, dated October 13, which provides that as from that date the following chemicals may be imported into the Netherlands East Indies free of import duty *when intended for certain industrial purposes*.

Goods.	Manufacture permitting exemption.
Active or non-active bleaching earth	} Soap, edible oils and fats.
Potassium bichromate	
Ferro-chloride	} Soap.
Aluminium sulphate	
Active carbon	Paper, purified glycerine and soap.
	Soap, edible oils and fats and the refining of sugar.
Copper sulphate	Three-ply and multi-ply boards and the refining of petroleum and other products prepared from crude petroleum.
Hydrochloric acid	Soap and medicated cotton wool and the working up of gold and silver ore.

Australian Customs Tariff

The following decision respecting the application of the Australian Customs Tariff is among those which have been issued recently by the Commonwealth Department of Trade and Customs. The undermentioned reagents for use in the treatment of ores by the flotation process are admitted free of duty under the British Preferential Tariff: Xanthates and xanthate compounds, but not including amyl xanthates, butyl xanthates, potassium xanthates or sodium xanthates.

At the request of the Ministry of Supply the Board of Trade have issued an Order (the Import of Goods (Prohibition) (No. 10) Order, 1939), adding to the list of goods which may not be imported, except under licence, the following categories of goods: Iron ore and scrap; non-ferrous metals, metal ores and scrap and manufactures thereof, including manganese, molybdenum, niobium (columbium), tantalum, tungsten, and vanadium; cemented carbide metal; calcium silicide; compounds of molybdenum, tantalum, titanium, tungsten, and vanadium; silicon in all forms; and iron and steel (including alloy steel) and several classes of products thereof. Exhaustive directions for obtaining licences are included in the Order (from H.M. Stationery Office, 1d.).

The Board of Trade have made an Order under which licences are no longer required for the export of transparent cellulose wrapping.

Chemical Trade in November

Imports and Exports Both Up

ACCORDING TO THE BOARD OF TRADE RETURNS for the month ended November 30, 1939, imports of chemicals, drugs, dyes and colours were valued at £1,424,878, compared with £1,213,381 in November, 1938, an increase of £211,497. For the eleven months ended November, 1939, imports were valued at £14,467,723, an increase of £2,198,327 compared with the corresponding period in 1938. Exports increased by £138,623 from £2,021,834 in November, 1938, to £2,160,457. Re-exports were valued at £27,877.

WAR RISKS INSURANCE

From January 1, 1940, open covers and renewals of existing covers will only be granted by the Government War Risks Insurance Office for periods of twelve months, but may, if desired, be made subject to cancellation at three months' notice by the assured. Covers tendered for renewal prior to January 1 will not be renewed for periods of less than three months. Hitherto there has been no minimum period for open covers effected with the Office and a number of short period covers have, in fact, been effected.

Textile Agents

The Search for the Perfect Finish

BEFORE the Royal Society of Arts recently Dr. C. J. T. Cronshaw, Chairman of Imperial Chemical Industries, Ltd. (Dyestuffs Group), delivered a lantern lecture on "Textile Agents"—that is to say, materials which have one thing in common, namely, that they all fulfil some special need at one stage or other of the manufacture of textile materials.

After a short historical introduction, the lecturer outlined the famous researches of Irving Langmuir on monomolecular layers and multiple layers, which led to the development of emulsifying agents and wetting-out substances. Dr. Cronshaw next dealt with the quaternary ammonium compounds, utilised as fixing agents for dyes and as proofing materials. Synthetic resins, too, he pointed out, had been used in the cotton industry for providing crease-resisting properties, superior finish, and improvement of pigment prints in calico-printing.

"The textile manufacturer," he said, "is always seeking to give his material the feel of a more closely woven material without the necessity of accomplishing it in this way. For years he has tried to accomplish this end by means of natural materials already to hand, like starch or china clay. None of these are to-day wholly satisfactory because any finish due to their use is transient; the first washing removes nearly all the finish. For this purpose, synthetic resins have also been tried, and cellulose derivatives also, but cellulose has the defect as a chemical starting-out material for these products of being as dear as cotton itself. Nevertheless some compounds of this type have found special uses—methyl cellulose, benzyl cellulose.

"Two soluble cellulose ethers are now being utilised. One of these is only soluble in caustic soda at low temperatures, below 60° C., but once dissolved they remain soluble at ordinary temperatures. When applied to the fibre and the alkali neutralised they are quite resistant to washing. The other type is soluble in water and, therefore, the effects do not completely stand up to washing, but do withstand what is called 'a light washing' very well. So whilst many contributions have been made and much of the cellulose chemistry surveyed, no completely all-purpose solution of this problem is yet to hand."

Britain's Economic Effort

Prime Minister's Reply to F.B.I. Representations

THE Prime Minister, who was accompanied by the Chancellor of the Exchequer and the President of the Board of Trade, received a deputation from the Federation of British Industries last week at No. 10 Downing Street. The deputation was introduced by Lord Dudley Gordon, the deputy president of the Federation, and included Lord Gainford, Sir George Beharrell, Sir George Macdonogh, Sir Francis Joseph, Mr. Guy Locock, and Mr. D. L. Walker.

The deputation emphasised the importance of the export trade as a vital part of the national war effort, and pressed upon the Government that it should not be regarded merely as an ancillary activity. To secure this, new methods must be employed without regard to precedents. The Federation realised that there were many conflicting claims on the productive capacity of the country for the Service Departments and other needs, but they urged that steps should be taken to secure a unified policy which would give its due place to the needs of the export trade. While recognising that they were not fully cognisant of all the present arrangements, they had suggested in a memorandum that there would be advantage in establishing a single authority charged with the oversight of the export trade and under the control of a member of the

War Cabinet, acting with the advice of a panel of industrialists.

The Prime Minister, replying, said that he and his colleagues fully shared the views of the Federation of British Industries as to the great importance in the national interest of maintaining the export trade. The other Ministers present gave an account of the existing machinery for the determination of priorities between conflicting claims upon productive capacity, and Sir John Simon assured them that the importance of the export trade and of the provision of foreign exchange were kept constantly in mind. The Prime Minister explained also the existing Ministerial and inter-Departmental arrangements for the coordination of economic policy and said that, in the circumstances, he did not think that there would at the present time be advantage in appointing a separate Minister for economic questions. He intimated, however, that under the changing conditions of war no decisions could be regarded as fixed and final if altered circumstances rendered a change desirable.

It was agreed that the President of the Board of Trade should communicate at once with the Federation in order to discuss the possibility of improving the existing machinery by the appointment of an advisory panel.

Oil-Water Emulsion

Methods of Preventing and Treating

THE petroleum industry has made great advancement in methods of handling "cut" or emulsified oil at low cost, states the Bureau of Mines, United States Department of the Interior, in a detailed report just published, which describes practical methods of preventing the formation of emulsions in oil-producing operations, modern practices of economically dehydrating crude-oil emulsions, and recent advances in emulsion-treating technique.

Emulsions of water and oil always have constituted one of the most serious forms of waste in the oil fields, and the dehydration of emulsified crude petroleum to obtain marketable oil is a problem that confronts operators in many fields. Within the last decade substantial improvements have been made in the art of resolving petroleum emulsions, and the present bulletin,¹ written by G. B. Shea, brings to date the technique of coping with the emulsion problem. The bulletin discusses various preventive and remedial measures by which emulsification may be minimised or avoided during the operations of producing and gathering crude oil. In attacking an emulsion problem with a view to reducing treating costs, the method of sampling is of primary importance in determining sources of emulsification, and the author has given a section of his bulletin to methods of sampling that eliminate emulsification in this operation, thereby assuring samples representative of the fluid in the system.

The batch and flow-line systems of chemical dehydration processes are discussed in detail with reference to both methods and equipment. A section dealing with treating temperatures and their effect on treating losses and the quantity of chemical used shows the savings that may be effected by reducing operating temperatures and increasing the quantity of chemical. The importance of properly handling and separating gas from "cut" oil in both chemical and electrical dehydration also is discussed. The report contains a section on "down-the-hole" treating, often a more effective and more economical method than chemical treating at the surface after the "cut" oil has been discharged from the well.

The different types of electric dehydrators and the design and operation of the three general types of electric dehydrating plants (namely, batch, flow-line and gravity-flow) are discussed; also treating costs, treating organisation and personnel.

¹ Bureau of Mines Bulletin 417, *Practices and Methods of Preventing and Treating Crude Oil Emulsions*, by G. B. Shea, (Government Printing Office, Washington, D.C., 30 cents).

THE CHEMICAL SITUATION IN GERMANY

Captured Polish Industries—Restrictions due to Import Losses

THE occupation of Poland by Germany and Russia brought by far the largest part of the chemical industry of Poland under German control. The former German territories of Eastern Silesia (with Kattowitz) and Danzig have been reunited with the Reich and the entire Silesian industrial area thus becomes an economic entity. The "German zone of interest" also includes the larger portion of the new industrial centre of Poland located between the Pilica and Bug rivers, the Beskid mountains and the Vistula. About two years ago a chemical centre was developed in the Sandomierz district, where products of military importance, such as explosives, ammunition, and nitrogen compounds, were turned out.

When the Osla district of Czechoslovakia was united with Poland in the autumn of 1938, another 15 establishments employing about 1,000 workers, including the Oderberger Chemische Werke, the Count Larisch Works, and five coke plants with an annual production of 13,000 tons of ammonium sulphate, were added to the Polish chemical industry. At the end of 1937 there were 992 chemical factories in Poland employing approximately 63,000 workers. The share of foreign capital in the Polish chemical industry is large. At the beginning of 1938 over 40 per cent. of the share capital of some £9,000,000 of Polish joint stock chemical companies was in foreign hands. According to local sources of information the total value of production of chemicals and allied products for all of Poland in 1937 was about £17,500,000.

The largest Polish chemical enterprise was the Government-owned United Explosive and Nitrogen Works, followed by the Polish Solvay Works, Ltd., which had its own coal pits and rock salt mines and two ammonia works. This latter company was the main producer of soda ash and caustic soda. The United Nitrogen Works were the largest producers of calcium carbide and cyanamide. About a quarter of the production of sulphuric acid was accounted for by the Giesche A.G., and the Silesian Mining and Zinc Smelting, Ltd. A large portion of the nitrogen is in ammonia and nitric acid derived therefrom; the value of these two products in 1937 was £2,600,000.

It is difficult to gauge the relation between domestic production and foreign trade, as Poland's foreign trade figures include Danzig, but it is believed that about 90 per cent. of Poland's requirements for chemicals were covered by domestic production. The chemical foreign trade of the former Polish-Danzig customs union was valued at £3,250,000, of which £2,844,000 represented imports.

Boron Consumption Restricted

As a war economy measure the Reich Government has decreed drastic restrictions on the consumption of boron compounds, says a U.S. consular report from Frankfurt-on-Main. In addition to previous prohibitions, the latest decree prohibits the use of boron compounds for manufacturing fire preventive agents, adhesives, starch products, bleaches, insecticides, paper, cardboard and wood-pulp, agents for retarding setting (as of cement), for the cleaning and polishing of metals, and for preserving purposes. Ceramic glazes may now be manufactured with not over 10 per cent. B_2O_3 , reckoned in terms of dry crude mixture of the batch. In the manufacture of glass, boron compounds may be used only for making optical glass, glass for chemical and technical apparatus, and related special technical uses. Enamel frit may be used only for one coat of the primary and surface enamel, namely, on the basis of a maximum of 10 per cent. B_2O_3 for primary enamel, and maximum of 5 per cent. B_2O_3 (dry crude mixture of the batch) for surface enamel. Quick-setting cements for mechanical cementing may not exceed 10 per cent. borax (calculated as sodium tetraborate crystallised— $Na_2B_4O_7 \cdot 10 H_2O$) in the dry batch.

Borax substitutes suitable for use in enamel manufacture are being developed, and success is reported in use of substitutes which enable a saving of 25 per cent. to be made in consumption of borax as fluxing agent in the production of enamel. Slags rich in alkalis, produced by the iron and steel industry, have been investigated as borax substitutes and it is believed that these materials can replace borax to a certain extent in the manufacture of enamel.

Synthetic Fodder Developments

To solve the fodder problem aroused by the cutting off of the supply of imported vegetable oil seeds, Germany has turned to chemistry and has succeeded in developing two outstanding potential domestic sources of protein fodder, obtainable by chemical synthesis, for replacing the huge quantities of imported oil. One of these methods concerns the synthetic production of fodder yeast from wood-sugar. By this method, 50 lb. of sugar can be produced from 100 lb. of wood waste, chips, etc., and from this sugar it is possible to produce 25 lb. of dry yeast with about 12 lb. of albumin. This method apparently has not yet been perfected commercially but notable progress has been reported and substantial amounts of fodder may well be supplied from this source in the future.

The other method has to do with the supplying of mineral nitrogen fodder. By this method, synthetically-produced nitrogenous compounds, especially urea, together with other food components poor in protein but rich in carbohydrates are used as cattle fodder. In recent times extensive experiments have been conducted by German governmental agencies with mixed amino fodder consisting of up to 60 per cent. oil-cake and 40 per cent. of so-called "amino-chips." These "amino-chips" are produced by uniting urea with hot molasses to the dry chips of sugar beets. The experiments demonstrated that the mixture was an excellent substitute for oil-cake and facilitated considerable increase in the output of cow's milk under conditions when ordinary protein fodders are scarce. In 1937 some 10,000 metric tons of this "mixed amino fodder" were fed to cattle in Germany, and owing to the favourable results the amount used was increased several hundred per cent. in 1938, with indications of a further rise in 1939 and coming years.

Other reports from the same source record the development of a process for manufacturing a turpentine substitute and a petroleum jelly substitute. The former is composed of approximately equal parts of cymene and turpentine and is reported to be fully equal to gum spirits of turpentine for various purposes, especially varnish manufacture. The latter product is said to be obtained by the hydrogenation of certain products occurring in conjunction with the manufacture of paraffin from domestic lignite.

PUMP WITH NEOPRENE TUBING

A pump recently introduced by the Huber Pump Co., New York, is designed to handle chemicals, foodstuffs, and corrosive and abrasive liquids. The tubing, rubber or Neoprene as dictated by the liquid being handled, is confined within a casing which prevents the tubing from expanding beyond its normal diameter and length, even under high pressures. Vacuum created by the action of the pump draws liquid into the tubing. The liquid is then squeezed out by pressure applied progressively from the intake to the discharge end by an eccentric rotor revolving within a circular compressor ring so adjusted that it completely closes the tubing which is forced against it by the progressive action of the rotor. A heavy elastic wall construction enables the tubing to spring back to its original form immediately after the rotor releases it, thereby creating a high vacuum on the suction side while a high pressure is being built up on the discharge side.

Personal Notes

MR. R. V. LAMING, British Commercial Secretary at the Hague, is now at the British Legation, Laan 19, The Hague.

PROFESSOR R. S. HUTTON, who is the Goldsmiths' Professor of Metallurgy at Cambridge, has been appointed chairman of the Council of the City and Guilds of London Institute, replacing the late Sir William Pope.

MR. JOHN CRAIG, C.B.E., chairman and managing director of Messrs. Colvilles, Ltd., steel manufacturers, and MR. J. M. MITCHELL, director of Messrs. James Nimmo and Co., Ltd., coalmasters, have joined the board of Messrs. James Dunlop and Co., Ltd., coal and ironmasters, Glasgow.

The pass list of the October-November examinations of the Institute of Chemistry of Great Britain and Ireland records that 28 candidates passed the examination in general chemistry for the Associateship; that one candidate, R. E. TEBBIT, was successful in the Fellowship examination in Branch C (Organic Chemistry), while three won equal success in Branch E (The Chemistry, including Microscopy, of Food and Drugs, and of Water), namely: R. A. LANGRIDGE, C. E. WATERHOUSE, and E. G. WILLIAMS.

OBITUARY

MR. F. T. AIREY, a divisional manager at the Pilkington Sullivan works of Imperial Chemical Industries, Ltd., Widnes, died last week, aged 45.

DR. WILHELM TSCHIRCH, formerly professor of pharmacognosy and practical chemistry at the University of Berne, died early this month at Berne, at the age of 83.

MR. R. BRUNSCHWIG, who died recently at the age of 47, had been serving as Controller of Coal Distribution in France since the outbreak of war. He was distinguished for his work on the chemistry of coal and its by-products and had been director of the Société "Carburants et Produits de Synthèse" and chief of the Comptoir d'Expansion des Mines du Nord.

PROFESSOR P. RIVALS, honorary dean of the Faculty of Science of the University of Marseilles, which he had served for 36 years, and former director of the Higher Technical Institute in that city, died last month. Professor Rivals was noted for his researches in the chemistry of oils and fats, and had been editor of the section of *Chimie et Industrie* dealing with those materials since the foundation of the journal.

SIR JOSEPH TURNER, head of Sir Joseph Turner and Sons, Ltd., dyestuff and chemical manufacturers, and former managing director of the British Dyestuffs Corporation, left estate valued at £18,365 (net personalty nil).

Through the will of the late MR. MATTHEW F. FINDLAY, partner in the firm of M. F. Findlay, explosive merchants, 19, Cadogan Street, Glasgow, who left estate valued at nearly £90,000, charitable institutions in Glasgow and the West of Scotland, numbering 27 in all, are to benefit to the aggregate sum of £16,200.

THE DAMAGE done during the recent civil war to the Spanish potash mines in Northern Catalonia is being speedily remedied. The roads and railways affording access to the ports and distributing centres are being repaired and it is expected that normal operations can quite soon be resumed. While the domestic market will receive first attention, it is expected that a part of the output will be available for export. The formation of a rational distributing organisation "Potasas Españolas," originally planned before the war, has been revived and rapid progress is being made towards its fulfilment.

Aluminium and Silicosis

Formation of Protective Film

SILICOSIS develops rather quickly in rabbits exposed to air containing moderate concentrations of quartz particles finer than about 5×10^{-4} cm., but is completely prevented if aluminium powder is also present in the air to the extent of about 1 per cent. by weight of the quartz powder. This protective action of aluminium powder has been studied experimentally by Denny, Robson, and Irwin (J. Can. Med. Assoc., 37, 1-11 and 40, 213-228), who established that aluminium forms, in the lungs, a protective film upon the surface of silica particles which prevents them from dissolving, and thus prevents toxic effects. The seriousness of silicosis in numerous industries indicates the importance of identification of this film. The smallness of the silica particles and the very small amount of aluminium (less than 1 per cent.) sufficient to cover them with a protective film make it evident that this film is extremely thin. L. H. Germer and K. H. Storks, of the Bell Telephone Laboratories, New York, working with Dr. F. C. Frary, now report a confirmation, by electron diffraction experiments, of the conclusions arrived at by Denny, Robson, and Irwin (loc. cit.) as to the nature of the film (Ind. Eng. Chem., Anal. Ed., XI, 11, 583-592).

They have found that the material which is precipitated upon silica by the reaction of water and aluminium is a hydrated oxide of aluminium. After drying, the film is crystalline and gives electron diffraction patterns characteristic of the variety of aluminium oxide monohydrate ($\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$) commonly called alpha-monohydrate in America, sometimes called boehmite, and identical with the natural monohydrate occurring in French bauxite. Their experiments have shown that aluminium hydrate is precipitated fairly rapidly upon silica at pH values lying within a range in which lie also the pH values of body fluids of men and of animals.

REGISTER OF SAFETY OFFICERS

It seems highly probable that a certain number of new safety officers' jobs will be created owing to war-time conditions. Existing safety officers' jobs may also fall vacant owing to their present holders being transferred to other work or to military service. In order to help those who want work as safety officers and firms who have vacant positions for such people, the National Safety First Association is setting up a register of safety officers. In order that the association may have the really important particulars readily available, a standard form has been produced. Any safety officer or other person wishing to have his name put on the register should write to the association at 52 Grosvenor Gardens, London, S.W.1, and ask for a copy of the form. On receipt of the completed form the association will add it to the register. The applicant has a choice either of having his name forwarded immediately to any firm offering a job for which he appears to have suitable qualifications or of being informed of such jobs and asked whether he would like his name to go forward.

The above is taken from the *Industrial Safety Bulletin*, November, 1939, 7 (81), which likewise records an "accident item" of special interest to the chemical industry. In the case described, a man working at a dye vat 9 ft. in diameter and rising 27 in. above the floor, overbalanced, fell in and was fatally scalded. There was no fencing. Section 18 of the Factories Act requires that vessels, structures, sumps and pits containing dangerous liquids shall be fenced to a height of 3 ft. if the top edge is less than that height. Proceedings were taken under Sections 18 and 133 and a penalty of £20 was imposed.

This vat has since been fenced by means of stanchions $3\frac{1}{2}$ ft. high bolted to the vat and connected together by means of chains. This type of fencing should not cause any interference with work.

General News

IT IS UNDERSTOOD that, for the duration of the war, no further preliminary or final reports on the Imports Duties Act Inquiry, 1937, will be published.

UNDER THE PETROLEUM (PRODUCTION) ACT, 1934, a prospecting licence to the Anglo-American Oil Co. has been renewed for 12 months. Some twelve square miles in Midlothian are included in the licensed area.

SCOTTISH OILS, LTD., has posted notices at the shale mines in West Lothian and Midlothian intimating a further increase in wages of 4d. a day. The increase is due to the cost of living and takes effect as from December 20.

A NEW METHOD for the gravimetric determination of tin in bronzes and brasses, by A. G. Dunbar-Poole (*Analyst*, 64, 765, 870-3), is based upon the discovery that when tin containing phosphorus or arsenic, or both, is ignited in air in presence of copper the phosphorus and arsenic are taken up by the copper to form a phosphate and arsenate respectively, without the formation of a stannate. A subsequent digestion in nitric acid leaves the insoluble tin oxide, whilst the copper, phosphorus, and arsenic go into solution.

WITH THE SHIPMENTS for November, the china clay industry appears to be proceeding along its pre-war level, despite the many difficulties on Continental markets. The closing of the German market alone means a loss of over 4,000 tons a year. The tonnage dealt with was 66,433 tons—about 3,000 tons less than in November, 1938, and 6,000 tons below the peak year of 1937. Though the tonnage of clay for November was satisfactory, china stone shipments were unusually low. If the present volume of business continues 1939 will not be looked on as an industrial black-out, thanks largely to the scientific uses for china clay—many more than in 1914-18.

THE MINISTRY OF HOME SECURITY has issued a warning against "detector discs" which purport to give an indication of the presence of poison gas. There is in existence, says the statement, a special yellow paint known as "detector paint," which may be seen on the tops of pillar-boxes and on boards in the streets, which changes colour if a drop of blister gas in liquid form falls on it. These painted surfaces are provided by the local authorities as a means of detecting gas spray. Small discs exist with this paint, which are on sale in a number of shops. It should be understood that even if "detector paint" is used these discs are useless for indicating the presence of gas, because they will give no reaction to gas vapour and are too small to be reliable indicators of falling vapour.

BEFORE THE MEMBERS of the Institute of Fuel in the Lecture Theatre of the Geological Society of London, Burlington House, Piccadilly, last week, a paper on the Improvement in the Calorific Value of Towns' Gas or Coke-oven Gas with reference to Utilisation as a Fuel for Motor Vehicles, was presented by Messrs. J. Ivon Graham and D. G. Skinner. The paper was specially opportune owing to the present control of the supply of petrol and the possibility of the use of alternative fuels for internal combustion engines. At the moment the fuels most readily available for direct use are towns' gas and coke-oven gas, whilst charcoal, anthracite, or coals of low volatile content may be employed for the production of gas in a portable producer plant. For journeys within a circumscribed area, as, for example, with municipal transport services, the use of coal gas in the compressed form has many advantages.

GOOD PROGRESS is reported by Imperial Chemical Industries, Ltd., in their campaign to produce more food from our gardens under the slogan: "Your Garden versus the U-Boats." This campaign, which is run in close co-operation with the Ministry of Agriculture, is directed rather to the private garden and allotment holder than to the commercial grower, and aims to persuade him to make himself self-supporting from his own garden. It is emphasised that the more essential and nutritious foodstuffs are grown in home gardens, the more ships will be released for war purposes with a consequent reduction of risk in the carrying of unnecessary tonnage. The campaign was opened at Eastbourne by Dr. H. V. Taylor, the Horticulture Commissioner, who has been supported by many eminent men, and enthusiastic meetings have been held in many districts. The first stage in the campaign concluded last week, but will start again immediately after the Christmas holidays.

From Week to Week

THE METAL CONTROL BOARD has increased the maximum prices of metal as follows:—Copper electro £62 per ton (formerly £46), lead £25 per ton (formerly £17 5s.), and spelter £25 15s. (formerly £15 12s. 6d.) per ton, all delivered. Increasing freight difficulties are mainly responsible, it is stated, for the sharp advance.

PROFESSOR J. P. KENDALL, Professor of Chemistry at Edinburgh University, is reported to have described as ridiculous the suggestion that mustard gas was used against the *Graf Spee*. It is elementary knowledge, he said, that mustard gas cannot be used in shells that explode in a high temperature. It was stupid of the Russians to attempt to use chloropierin gas in a country like Finland where the temperature is too low for such a gas to be used with any hope of success.

Foreign News

A SYNTHETIC resin plant was recently completed at Rosbery, a suburb of Sydney, N.S.W., by Reichhold Chemicals Inc., Detroit, U.S.A. It is hoped to have the new plant in operation early in 1940.

A NEW oil refining plant at Haifa, Palestine, has started production. The plant will operate on half of the 2,000,000 tons of crude oil brought annually from Iraq in the I.P.C. pipeline.

EXPORTS of coal-tar dyes from France during the first half of 1939 increased to 22,490 metric quintals valued at 97,268,000 francs from 15,460 quintals, of a value of 67,191,000 francs, during the corresponding six months of 1938.

EXPORTS of tartaric acid from France increased to 2,073 metric quintals (3,346,000 francs) in the first half of 1939 from 1,782 quintals (2,310,000 francs). Of these shipments, 1,218 quintals (2,026,000 francs) went to French colonies.

IN ORDER TO AVOID a possible shortage in potash salts available for American agriculture next spring, the producers of domestic potash in the U.S.A. have temporarily suspended export shipments. For the past year, these have been handled by the Potash Export Association, formed by the American producing companies. While the Association is accepting no new orders at present, its organisation is being kept intact until the return to normal times.

PRODUCTION OF PALESTINE POTASH is now being greatly accelerated, states Mr. Novomeysky, concessionaire of the Dead Sea Potash Works, in the current issue of "Palestine and the Middle East." From 60,000 to 70,000 tons are now exported yearly, and a projected 5-year-plan of development, rising by 35 per cent. increases, is expected to be fulfilled in half the time, or less. Owing to the withdrawal of Germany, Russia and Poland from the market, the extensive damage to Spanish mines in the civil war, and the proximity of the French mines to the war zone, Palestine is in the position of being now the chief source of potash supply to both the neutral and Allied countries. As by-products, Palestine Potash Works are also to produce antidotes for mustard-gas, caustic soda, caustic potash, and bleaching powder—as well as magnesium salts and mixed fertilisers.

STATISTICAL DETAILS concerning the rapid development of Torro di Zuino, the "Cellulose City" of Italy, were given recently, following the official visit to the city of Signor Tassinari, Under Secretary of State for Agriculture. On the agricultural side, 2,500 hectares are now under cultivation of various cellulose-yielding plants, as compared with the 1,200 hectares under cultivation on September 21, 1938, when the work was officially inaugurated by Signor Mussolini. This area will be increased to 5,500 hectares by 1942. On the industrial side, production now amounts to 35,000 kilograms a day. In 1938, the annual output was six million kilograms; by next year it will be thirty million kilograms, and within five years it is expected to be between fifty and sixty million kilograms. At present, 3,500 workers are employed on the agricultural and production sides together. The cellulose produced is of exceptionally good quality, it is claimed, containing 96 to 97 per cent. of α -cellulose, against 87 to 88 per cent. contained in imported cellulose. From the Torre di Zuino cellulose the Snia Viscosa is producing an artificial fibre at its Cesano Maderno plant which, it claims, is stronger than cotton.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

- HYDRAULIC MECHANISM.—British Thomson-Houston Co., Ltd. 30180.
- RESINOUS COMPOSITIONS.—British Thomson-Houston Co., Ltd. (United States, Nov. 23, '38.) 30469.
- TREATMENT OF HYDROCARBON MIXTURES.—British Thomson-Houston Co., Ltd. (United States, Nov. 23, '38.) 30470.
- COMPOSITE MATERIALS.—Carbide and Carbon Chemicals Corporation. (United States, Dec. 6, '38.) 30463.
- METHOD FOR MAKING PLASTIC COMPOSITIONS.—Carbide and Carbon Chemicals Corporation. (United States, Dec. 15, '38.) 30464.
- SEPARATION OF PREGNENOLONE ESTERS.—G. M. Clark (Schering Corporation). 30597.
- TREATMENT OF CELLULOSIC MATERIALS.—Courtaulds, Ltd., E. E. Tallis and W. J. C. Field. 30565.
- VULCANISATION OF RUBBER.—E. I. du Pont de Nemours and Co. (United States, Nov. 18, '38.) 30409.
- MANUFACTURE OF TEXTILE-TREATING AGENTS.—E. I. du Pont de Nemours and Co. (United States, Nov. 18, '38.) 30401.
- SIMULTANEOUS PRODUCTION OF MAGNESIUM AND LOW CARBON FERRO-ALLOYS.—S. A. Electrometal, and E. A. Pokorny. (Oct. 17, '38.) 30380.
- CALCIUM HYPOCHLORITE PRODUCT, ETC.—H. G. C. Fairweather (Mathieson Alkali Works, Inc.). 30256.
- METHOD OF CRUSHING HETEROGENEOUS MATERIAL.—H. G. C. Fairweather (Mathieson Alkali Works, Inc.). 30428.
- DIAZOTYPIC PROCESSES.—P. Frangialli. (France, Nov. 19, '38.) 30407.
- MANUFACTURE OF DYESTUFFS becoming green when chromed.—J. R. Geigy, A.-G. (Switzerland, Aug. 11, '38.) 30496.
- TREATMENT OF RAW MATERIALS for use in manufacture of cement, etc.—M. Vogel-Jorgenson. 30231.
- PROCESS FOR THE CATALYTIC TREATMENT OF HYDROCARBONS.—N. V. de Bataafsche Petroleum Maatschappij. (Holland, Nov. 30, '38.) 30402.
- PROCESS FOR REMOVING ACID COMPONENTS from hydrocarbons or derivatives thereof.—N. V. de Bataafsche Petroleum Maatschappij. (Dec. 8, '38.) (United States, July 15, '38.) 30581.
- PRODUCTION OF CARRIERS for catalysts for the hydrogenation of carbon monoxide.—H. E. Potts (N. V. Internationale Kool-waterstoffen Synthese Maatschappij (International Hydrocarbon Synthesis Co.)). 30547.
- TREATMENT OF FATS.—P. P. Ruzek. 30493.
- MANUFACTURING SULPHUROUS ANHYDRIDE, alumina, and cements starting from sulphates of calcium.—J. C. Seailles. 30606.
- MANUFACTURE OF KETOLS of the cyclopentanopolhydrophenanthrene series or derivatives.—Soc. of Chemical Industry in Basle. (Switzerland, Nov. 19, '38.) 30403.
- MANUFACTURE OF SATURATED OR UNSATURATED 17-oxy-17-acyl-androstanones or derivatives thereof.—Soc. of Chemical Industry in Basle. (Switzerland, Nov. 19, '38.) 30404; (Switzerland, Oct. 24, '38.) 30405.
- MANUFACTURE OF ETHERS from olefines.—Standard Alcohol Co. (United States, Dec. 31, '38.) 30580.
- MANUFACTURE OF BLENDED HYDROCARBON OILS, ETC.—Standard Oil Development Co. (United States, Dec. 16, '38.) 30306; (United States, Sept. 12, '38.) 30307.
- PROCESS FOR CONCENTRATING OLEFINS and separating same from gaseous mixtures.—Standard Oil Development Co. (United States, Dec. 30, '38.) 30480.
- CONCENTRATION AND STORAGE OF OLEFINS.—Standard Oil Development Co. (United States, Dec. 30, '38.) 30481.
- SEPARATION OF OLEFINS from gaseous mixtures and storage of such olefins.—Standard Oil Development Co. (United States, Dec. 30, '38.) 30482.
- PRODUCTION OF REFRACTORIES.—J. G. Stein and Co., Ltd., and J. F. Hyslop. 30190.
- METHOD OF MANUFACTURING EXPLOSIVES, and products obtained thereby.—P. W. Streiffert. (Denmark, Nov. 18, '38.) 30450.
- BIOLOGICALLY ACTIVE LIPOIDS.—I. Sugar and A. G. Ross. 30310.
- STERILISATION OF BACTERIA.—V. A. Trier, and Andre (Compagnies), Ltd. 30421, 30422.
- MANUFACTURE OF AMINO CYCLIC SULPHONYL COMPOUNDS.—Ward, Blenkinsop, and Co., Ltd., B. P. H. Wiesner, and E. Katscher. 30598.
- PRODUCTION OF MOTOR FUELS.—Anglo-Iranian Oil Co., Ltd., H. F. Dare and D. A. Howes. 30767.
- APPARATUS FOR CONVERTING CHEMICAL into mechanical energy.—S. G. Bauer. 30931.
- GAS-PRODUCING APPARATUS.—Bennett and Sayer, Ltd., and N. W. Sayer. 31025.
- PREPARATION OF THERAPEUTICALLY USEFUL COMPOUNDS.—Boots Pure Drug Co., Ltd., H. H. L. Levene and F. L. Pyman. 31078.
- ANODIC TREATMENT OF ALUMINIUM and its alloys.—E. Windsor-Bowen and C. H. R. Gower. 30884.
- VITREOUS INSULATORS.—R. Delloye. (France, Oct. 2, '38.) 30887.
- MANUFACTURE OF SULPHATION PRODUCTS.—E. I. du Pont de Nemours and Co. and M. Engelmann. 30735.
- MANUFACTURE OF ORGANIC SULPHONATION PRODUCTS.—E. I. du Pont de Nemours and Co. and M. Engelmann. 30980.
- MANUFACTURE OF SURFACE-ACTIVE MATERIALS.—E. I. du Pont de Nemours and Co. and A. L. Fox. 30979.
- MEANS FOR PREVENTING EMISSION OF SPARKS, ETC., from uptakes and for eliminating and recovering acids, etc., from gases in pipe lines.—H. Fay. 30937.
- PROCESS FOR THE ISOMERISATION OF CHLOR-ALKANES.—J. G. Fife (N. V. de Bataafsche Petroleum Maatschappij). 30873.
- PROCESS AND PRODUCTION OF intense luminous compounds.—E. Flaschner and E. Flaschner. 31030.
- PROCESS FOR THE PRODUCTION of water-soluble high molecular α -substituted aralkyl amines and derivatives thereof, and the resulting products.—J. R. Geigy A.-G. (Switzerland, Nov. 25, '38.) 30704. (Switzerland, Dec. 1, '38.) 30705.
- MANUFACTURE OF PHTHALIC ACID MONOARYLAMIDES.—J. R. Geigy A.-G. (Switzerland, Nov. 30, '38.) 30862.
- THERMOPLASTIC PRINTING INKS.—Interchemical Corporation and A. H. Stevens. (United States, Dec. 8, '38.) 30768.
- MANUFACTURE OF THERAPEUTICALLY USEFUL HETEROCYCLIC COMPOUNDS.—May and Baker, Ltd., and J. N. Ashley. 31001.
- CATALYTIC HEATERS.—Monitor Engineering and Oil Appliances, Ltd., H. T. Angus and R. E. Smith. 30840.
- PROCESS OF PRODUCING MOLECULAR COMPOUNDS of a pyrazolon with disubstituted acetamides.—F. G. Moore. 31006.
- PROCESS FOR THE PRODUCTION of heteropolymeric aliphatic ketone peroxides and of liquid fuels containing such peroxides.—N. V. de Bataafsche Petroleum Maatschappij. (Holland, Dec. 2, '38.) 30874.
- PROCESS FOR THE PRODUCTION of lubricants.—N. V. de Bataafsche Petroleum Maatschappij. (Holland, Dec. 2, '38.) 30875.
- PROCESS FOR THE PRODUCTION of liquid saturated hydrocarbons.—N. V. de Bataafsche Petroleum Maatschappij. (Holland, Dec. 16, '38.) 30376.
- SULPHANILAMIDOAMINO-PYRIDINES and process of producing same. Nepera Chemical Co., Inc. (United States, Nov. 29, '38.) 30902.
- MANUFACTURE OF RUBBER CHLORIDE.—Raolin Corporation. (United States, Dec. 12, '38.) 30877.
- MANUFACTURE OF POLYMERISATION PRODUCTS.—Standard Oil Development Co. (United States, Dec. 31, '38.) 31010.

Complete Specifications Open to Public Inspection

- PROCESS FOR THE MANUFACTURE OF KETONES of the cyclopentanopolhydrophenanthrene series.—Schering, A.-G. April 21, 1938. (Cognate Application, 8513-4/39.) 8612/39.
- PROCESS FOR THE PREPARATION OF A COMPOUND of 3:4 dioxyphenylethanolmethylamine stable to oxidation.—Byk-Guldenwerke Chemische Fabrik, A.-G. April 25, 1938. (9327/39.)
- AUTOMATIC PRESS for working up synthetic resin plastics.—H. Rommler, A.-G. April 21, 1938. 9410/39.
- PROCESS FOR THE PRODUCTION OF ARTIFICIAL RESINS from phenols and formaldehyde.—Vereinigte Chemische Fabriken Kreidl, Heller and Co., NFG. April 26, 1938. 9472/39.
- METHOD OF INCREASING THE AROMATIC CONTENT OF HYDROCARBONS.—M. W. Kellogg. April 23, 1938. 11484/39.
- PROCESS FOR THE PRODUCTION OF DI-AMIDE OR POLYAMIDE RESINS.—Vereinigte Chemische Fabriken Kreidl, Heller and Co., NFG. April 26, 1938. 9473/39.
- PROCESS FOR THE MANUFACTURE OF WATER-SOLUBLE, INJECTABLE COMPOUNDS of sulphanilic acid amides.—F. Hoffman-La Roche and Co., A.-G. April 26, 1938. 10133/39.
- CERAMIC GOODS, and process for their manufacture.—R. Bosch, Ges. April 23, 1938. (Cognate Application, 11493/39.) 11492/39.
- MANUFACTURE OF MODIFIED OLEFINE RESINS.—E. I. du Pont de Nemours and Co. April 26, 1938. 11842/39.
- MANUFACTURE OF BENZIDINE.—E. I. du Pont de Nemours and Co. April 23, 1938. 12295/39.
- PLASTICISING RUBBER SUBSTITUTES.—E. I. du Pont de Nemours and Co. April 26, 1938. (Cognate Applications, 12304-5-6/39.) 12303/39.
- PROCESS FOR THE PRODUCTION OF POLARISING BODIES.—E. Kaesemann. April 25, 1938. (Cognate Application, 12316/39.) 12315/39.
- PROCESS FOR THE PRODUCTION OF COMPLEX ETHERS containing aromatic radicals.—I. G. Farbenindustrie, A.-G. April 26, 1938.
- MANUFACTURE OF CARBOXYLIC ACIDS.—E. I. du Pont de Nemours and Co. April 25, 1938. 12438/39.
- SULPHUR POLYMERISED CHLOROPRENE.—E. I. du Pont de Nemours and Co. April 26, 1938. (Cognate Application, 12449/39.) 12448/39.
- CELLULOSIC COMPOSITIONS of matter containing organic ester amides.—Kodak, Ltd. April 26, 1938. 12482/39.

PRODUCTION OF PARAFFIN MIXTURE readily oxidisable into the form of fatty acids.—Henkel and Cie, Ges. April 28, 1938. 6762/39.

PRODUCTS AND PROCESSES for stimulation of cellular metabolism. Institutum Divi Thomae Foundation. April 29, 1938. 7964/39.

PREPARATION OF CHOLESTEROL from materials containing same.—Armour and Co. May 3, 1938. 8989/39.

DECOMPOSITION OF WATER-INSOLUBLE PHOSPHATES.—I. G. Farbenindustrie. April 7, 1938. 10356/39.

PROCESS FOR APPLYING cellulose derivative lacquers.—Commercial Solvents Corporation. April 29, 1938. 11362/39.

RECOVERY OF ELEMENTARY SULPHUR from pyrites.—I. G. Farbenindustrie. April 27, 1938. 12266/39.

RESINOUS COMPOSITIONS and methods of making same.—British Thomson-Houston Co., Ltd. April 27, 1938. 12414/39.

MANUFACTURE OF DERIVATIVES of unsaturated hydrocarbon chlorides of increased molecular weight.—Rohm and Haas Ges. April 27, 1938. 12532/39.

MANUFACTURE OF FERROMAGNETIC MATERIAL.—Steatit-Magnesia A.-G. April 27, 1938. 12533/39.

PROCESS FOR THE MANUFACTURE of condensation products from nucleic alkylated hydroquinones.—F. Hoffmann-La Roche and Co. A.-G. April 29, 1938. 12621/39.

MANUFACTURE OF SULPHUR DYE-STUFF PREPARATIONS.—I. G. Farbenindustrie. April 27, 1938. 12660/39.

MANUFACTURE OF MOTH-PROOFING AGENTS.—I. G. Farbenindustrie. April 28, 1938. 12661/39.

MANUFACTURE OF ACID AMIDES.—I. G. Farbenindustrie. April 28, 1938. 12662/39.

RESINOUS COMPOSITIONS.—British Thomson-Houston Co., Ltd. April 29, 1938. 12768/39.

INSECTICIDAL COMPOSITIONS.—E. I. du Pont de Nemours and Co. April 28, 1938. 12802/39.

PROCESS FOR THE MANUFACTURE of sulphonated ketones.—I. G. Farbenindustrie. April 30, 1938. 13016/39.

MANUFACTURE OF TRISAZO DYE-STUFFS.—I. G. Farbenindustrie. May 2, 1938. 13017/39.

STABILISING OF CELLULOSIC MATERIALS treated with halogenobutadienes.—Imperial Chemical Industries, Ltd. April 29, 1938. 13022/39.

METHOD OF AND APPARATUS for drying printing ink.—Interchemical Corporation. May 3, 1938. 13093/39.

MANUFACTURE OF PLASTICS.—I. G. Farbenindustrie. May 3, 1938. 13135/39.

Specifications Accepted with Date of Application

MANUFACTURE OF MERCAPTALS and mercaptols.—Deutsche Hydrierwerke, A.-G. May 7, 1937. 514,535.

THERMAL DECOMPOSITION OF METAL SALTS.—Metallges., A.-G., and K. Ebner. May 9, 1938. 514,538.

LOW-TEMPERATURE CARBONISATION FURNACES.—J. S. Scoular. May 10, 1938. 514,556.

FILMS OF RUBBER HYDROHALIDE.—R. P. Dinsmore. May 10, 1938. 514,560.

METHODS OF REMOVING METAL by means of oxidising gas jets. Linde Air Products Co. June 11, 1937. 514,574.

MANUFACTURE OF BARIUM COMPOUNDS.—A. G. Allen (Stockton), Ltd., and D. Tyrer. June 1, 1938. 514,583.

CATALYTIC DEHYDROGENATION OF ISOPROPYL BENZENE.—Distillers Co., Ltd., and H. M. Stanley. June 1, 1938. 514,587.

MANUFACTURE OF ARTICLES moulded from cellulosic fibrous pulp. I. B. Berghoff. July 6, 1938. 514,591.

PRODUCTION OF SYNTHETIC RESINS, moulding compositions and powders, and moulded articles.—F. Pollak. Feb. 4, 1938. (Divided out of 7277/38.) 514,507.

MANUFACTURE OF CYCLIC KETONES.—R. Robinson. May 5, 1938. (Divided out of 514,516.) 514,592.

IMPROVING IRON-BERYLLIUM ALLOYS.—Seri Holding Soc. Anon. June 30, 1937. 514,592.

ACID ANTHRAQUINONE DYE-STUFFS.—S. Coffy, F. Lodge, and Imperial Chemical Industries, Ltd. May 4, 1938. 514,770.

PREPARING PHOSPHORUS-CONTAINING ORGANIC COMPOUNDS useful as interface modifying agents, and the compounds so prepared.—Emulsol Corporation. Feb. 11, 1937. 514,721.

MANUFACTURE OF ORGANIC ACIDS and metal salts and esters thereof.—J. W. C. Crawford, N. McLeish, and Imperial Chemical Industries, Ltd. Feb. 10, 1938. (Cognate Applications, 5209/38 and 8051/38.) 514,619.

MANUFACTURE OF CYANINE DYES, and their use in modifying the properties of photographic emulsions.—Kodak, Ltd., and B. Beilenson. Feb. 12, 1938. (Addition to 478,945.) 514,621.

COMPOSITIONS containing solid polymers of ethylene.—E. G. Williams, and Imperial Chemical Industries, Ltd. May 3, 1938. 514,687.

MANUFACTURE OF DYE-STUFFS of the anthraquinone series.—Soc. of Chemical Industry in Basle. May 11, 1937. 514,637.

MANUFACTURE OF ARTIFICIAL SILK.—I. G. Farbenindustrie. May 11, 1937. 514,638.

MANUFACTURE OF OESTROGENIC COMPOUNDS.—Schering A.-G. May 11, 1937. 514,642.

PRODUCTION OF POLYHYDRIC ALCOHOLS.—A. G. Hellicar, A. W. Taylor, and Imperial Chemical Industries, Ltd. May 11, 1938. 514,693.

JOINTS FOR CERAMIC MATERIALS.—K. L. G. Sparking Plugs, Ltd., and C. M. Carington. May 12, 1938. 514,661.

PRINTING TEXTILE FABRICS or other materials.—Soc. of Chemical Industry in Basle. May 13, 1937. (Cognate Application, 14332/38.) 514,708.

PROCESS FOR THE MANUFACTURE OF AROMATIC SULPHONIC CHLORIDE SULPHONIC ACIDS and salts thereof.—I. G. Farbenindustrie. May 13, 1937. 514,711.

PREPARING A STABLE BITUMEN DISPERSION and its use in the production of cement-bitumen grouts.—Colas Products, Ltd., J. F. T. Blott, and J. A. Rawlinson. May 14, 1938. 514,747.

MANUFACTURE OF FUNGICIDAL PREPARATIONS, comprising organic compounds of mercury.—M. Fitzgibbon, and Lunevale Products, Ltd. May 16, 1938. 514,831.

APPARATUS FOR DILUTING and delivering viscous liquids and compositions.—Bennett (Hyde), Ltd. May 14, 1937. 514,786.

MANUFACTURE AND PRODUCTION OF OLEFINE OXIDES.—G. W. Johnson (I. G. Farbenindustrie.) May 16, 1938. 514,792.

MANUFACTURE OF VINYL HALIDES.—I. G. Farbenindustrie. May 28, 1937. 514,795.

MANUFACTURE OF ARALKYLAMINO-PHENOLS.—E. I. du Pont de Nemours and Co., C. O. Henke, and R. G. Benner. May 16, 1938. 514,796.

FAT-SOLUBLE CONDENSATION PRODUCTS.—A. H. Stevens (Ross and Rowe, Inc.). May 17, 1938. 514,848.

MANUFACTURE OF SUBSTITUTED PERINAPHTHINDIIONES.—Soc. of Chemical Industry in Basle. May 18, 1937. 514,850.

MANUFACTURE AND PRODUCTION OF DYE-STUFFS of the phthalocyanine series.—G. W. Johnson (I. G. Farbenindustrie.) May 17, 1938. 514,857.

COLOURED BITUMEN DISPERSION and process for its manufacture.—Colas Products, Ltd. April 22, 1938. (Samples furnished.) 514,818.

PRODUCTION OF MIXTURES OF HYDROCARBONS containing a high proportion of olefines from carbon monoxide and hydrogen.—London Testing Laboratory, Ltd., and M. Steinschlaeger. Feb. 18, 1938. 515,037.

SYNTHETIC PRODUCTION OF MOTOR FUELS.—Anglo-Iranian Oil Co., Ltd., A. E. Dunstan and F. E. A. Thompson. Feb. 22, 1938. 515,039.

RESINOUS CONDENSATION PRODUCTS and the production thereof.—H. J. Tattersall and Imperial Chemical Industries, Ltd. Feb. 22, 1938. 514,989.

EFFERVESCENT COMPOSITION containing magnesium hydroxide, and method of making same.—A. W. Pauley. March 20, 1937. 514,888.

PROCESS FOR THE MANUFACTURE OF beryllium oxide.—Seri Holding Soc. Anon. March 23, 1937. 514,992.

MAKING SULPHUR DIOXIDE AND LIME.—A. N. Mann. April 19, 1938. 514,993.

TREATMENT OF LAC OR SHELLAC.—A. F. Suter, A. Janser, and W. E. Suter. May 16, 1938. 515,060.

METHOD OF MAKING FERROUS ALLOYS containing chromium.—F. C. T. Daniels. April 8, 1938. 514,894.

MANUFACTURE AND APPLICATION of synthetic rubber-like materials.—J. G. Anderson, R. Hill, L. B. Morgan, and Imperial Chemical Industries, Ltd. May 18, 1938. 514,912.

MANUFACTURE OF MERCAPTO-ARYLENE-THI-IZOLFS.—United States Rubber Products, Inc. May 27, 1937. 515,015.

PREPARATION OF AQUEOUS EMULSIONS.—P. P. Hiltner. Oct. 11, 1937. 515,021.

PRODUCTION OF LOW-CARBON IRON.—Sachtleben A.-G. fur Bergbau und Chemische Industrie. July 16, 1937. 514,978.

DEHYDRATION BY AZEOTROPIC DISTILLATION.—Usines de Melle. May 25, 1937. 515,025.

MANUFACTURE OF AZO DYE-STUFFS.—Soc. of Chemical Industry in Basle. May 22, 1937. 515,098.

MANUFACTURE OF DYE-STUFFS.—Soc. of Chemical Industry in Basle. May 22, 1937. 515,099.

ALKALINE DETERGENT PRODUCTS.—Griffith Laboratories, Inc. June 14, 1937. 515,100.

REMOVING NAPHTHENIC ACIDS from mineral oil or oil fractions. H. E. Girling (legal representative of H. D. Eikington, deceased) (N. V. de Bataafsche Petroleum Maatschappij). May 23, 1938. 515,069.

PHENOL-ALDEHYDE CONDENSATION PRODUCTS.—I. G. Farbenindustrie. May 24, 1937. 515,112.

METHODS OF PRODUCING fluorides of alkali metals and aluminium. H. W. Heiser. May 24, 1937. 515,113.

PRODUCTION OF MONO-VINYL ACETYLENE.—H. E. Potts (Consortium fur Elektrochemische Industrie Ges.). June 11, 1938. 514,923.

Amended Specifications Published

PRODUCING GAS FROM OIL.—Nagel. 476,275.

DERIVATIVES OF STARCH.—Houghton and another. 493,513.

MANUFACTURE OF Δ^4, Δ^5 UNSATURATED 3-KETONES of the cyclopentanopolymethylenanthrene series.—Bloxam (Soc. of Chemical Industry in Basle). 497,394.

AZO DYE-STUFFS.—Carpmael (I. G. Farbenindustrie.) 498,241.

Weekly Prices of British Chemical Products

THE demand for general chemicals this week has been good and contract deliveries have covered fairly substantial quantities. The new contract price for formic acid shows an advance of £2 10s. per ton, but for other leading industrial chemicals quotations for new forward bookings are not yet fixed. Following the substantial increase in the official maximum price for the metal quotations for lead oxides have been advanced by £7 per ton and white lead has been advanced by £6 10s. per ton, the increase dating from December 19. Prices elsewhere remain steady with a number of imported materials quoted at higher rates. In the market for coal tar products trade has followed a normal course. There are no alterations in quotations to record and values remain steady with a decidedly firm undertone.

MANCHESTER.—To some extent trade in chemical products on the Manchester market during the past week has been under holiday influences. The new price position in respect of a number of materials for delivery over the early part of next year is still somewhat uncertain, and new bookings have in consequence been held up. There has, however, been a steady call for supplies against old contracts though these, as usual, will be interfered with owing to the holidays. With regard to the by-products, prices are mostly on a firm basis and a fair volume of inquiry has been reported.

GLASGOW.—There is considerable uncertainty about the position with contracts during 1940 and a general rise in prices is expected when renewals take place. Increases are taking place in all paper-packed materials. Business during the past week has been quieter and great difficulty has been experienced in securing supplies of many minerals. Starches are still scarce and may be so for some time.

Price Changes

Rises: Chrometan Crystals, Formic Acid, Lead (Red and White), Sodium Sulphide Crystals (Manchester), Toluol (Manchester), Xylol (Manchester), Zinc Oxide, Zinc Sulphate, Zinc Sulphide.

*In the case of certain products, here marked with an asterisk, the market is nominal, and the last ascertainable prices have been included.

†Benzol prices remain nominal, owing to doubts concerning the control position.

General Chemicals

ACETIC ACID.—Maximum prices per ton: 40% technical, 1 ton or over, £15 12s.; 10 cwt. and less than 1 ton, £16 12s.; 4 cwt. and less than 10 cwt., £17 12s.; 80% technical, 1 ton, £29 5s.; 10 cwt./1 ton, £30 5s.; 4/10 cwt., £31 5s.; 80% pure, 1 ton, £31 5s.; 10 cwt./1 ton, £32 5s.; 4/10 cwt., £33 5s.; commercial glacial, 1 ton, £37; 10 cwt./1 ton £38; 4/10 cwt., £29; delivered buyers' premises in returnable barrels.

ACETONE.—Maximum prices per ton, 50 tons and over, £39; 10/50 tons, £39 10s.; 5/10 tons, £40; 1/5 tons, £40 10s.; single drums, £41 10s., delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each; delivered in containers of less than 45 gallons but not less than 10 gallons £10 10s. per ton in excess of maximum prices; delivered in containers less than 10 gallons each £10 10s. per ton in excess of maximum prices, plus a reasonable allowance.

*ALUM.—Loose lump, £8 7s. 6d. per ton d/d.

*ALUMINIUM SULPHATE.—£7 5s. 0d. per ton d/d Lancs.

AMMONIA, ANHYDROUS.—99.95%, 1s. to 2s. per lb. according to quantity in loaned cylinders, carriage paid; less for important contracts.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey galvanising, £18 per ton, in casks, ex wharf. See also Salammuniac.

*ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—99/100%, about £25 per ton, ex store.

BARIUM CHLORIDE.—90/100%, prime white crystals, about £11 per ton when available, in casks, ex store; imported material would be dearer.

BLEACHING POWDER.—Spot, 35/37% £9 5s. per ton in casks, special terms for contract.

BORAX, COMMERCIAL.—Granulated, £20 10s. per ton; crystal, £21 10s.; powdered, £22; extra finely powdered, £23; B.P. crystals, £29 10s.; powdered, £30; extra fine, £31 per ton for ton lots in free 1-cwt. bags, carriage paid in Great Britain. Borax Glass, lump, £64; powder, £65; in tin-lined cases for home trade only, packages free, carriage paid in Great Britain.

BORIC ACID.—Commercial granulated, £34 10s. per ton; crystal, £35 10s.; powdered, £36 10s.; extra finely powdered, £38 10s.; large flakes, £47; B.P. crystals, £43 10s.; powdered, £44 10s.; extra fine powdered, £46 10s. per ton for ton lots, in free 1-cwt. bags, carriage paid in Great Britain.

CALCIUM BISULPHITE.—£7 10s. per ton f.o.r. London.

*CALCIUM CHLORIDE.—GLASGOW: 70/75% solid, £5 12s. 6d. per ton ex store.

CHARCOAL LUMP.—£7 5s. to £11 per ton, ex wharf. Granulated £7 to £9 per ton according to grade and locality.

*CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 4½d. per lb. d/d station in single 70-lb. cylinders.

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d station in drums.

CHROMIC ACID.—10½d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—1s. 1d. per lb., d/d U.K.

CITRIC ACID.—1s. 1½d. per lb. MANCHESTER: 1s. 2½d.

*COPPER SULPHATE.—Nominal.

CREAM OF TARTAR.—100%, £5 2s. to £5 7s. per cwt., less 2½%. Makers' prices nominal, imported material about £170 per ton.

FORMALDEHYDE.—40% by volume, £22 to £23 per ton, according to quantity, in casks, ex store.

FORMIC ACID.—85%, £44 10s. per ton for ton lots, carr. paid, carboys returnable; smaller parcels quoted at 46s. 6d. to 49s. 6d. per cwt., ex store.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £3 10s. to £4 10s. per cwt. according to quantity; in drums, £3 2s. 6d. to £3 16s. 0d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

HEXAMINE.—Technical grade for commercial purposes, 1s. 4d. per lb.; free-running crystals are quoted at 1s. 7d. per lb.; carriage paid for bulk lots.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 11s. 2d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £30 10s. per ton; 50% by weight, £35; 80% by weight, £60; pale tech., 50% by vol., £36; 50% by weight, £42; 80% by weight, £67. One ton lots ex works; barrels returnable.

LEAD ACETATE.—LONDON: White, £48 to £50, ton lots.

LEAD NITRATE.—About £40 per ton in casks.

LEAD, RED.—English, 5/10 cwt., £41 10s.; 10 cwt. to 1 ton, £41 5s.; 1/2 tons, £41; 2/5 tons, £40 10s.; 5/20 tons, £40; 20/100 tons, £39 10s.; over 100 tons, £39 per ton, less 2½ per cent., carriage paid; non-setting red lead, 10s. per ton dearer in each case; Continental material, £1 per ton cheaper.

LEAD, WHITE.—Dry English, less than 5 tons, £51; 5/15 tons, £47; 15/25 tons, £46 10s.; 25/50 tons, £46; 50/200 tons, £45 10s. per ton, less 5% carriage paid; Continental material, £1 per ton cheaper. Ground in oil, English, 1/5 cwt., £59; 5/10 cwt., £58; 10 cwt. to 1 ton, £57 10s.; 1/2 tons, £56; 2/5 tons, £55; 5/10 tons, £53; 10/15 tons, £52; 15/25 tons, £51 10s.; 25/50 tons, £51; 50/100 tons, £50 10s. per ton, less 5% carriage paid. Continental material £2 per ton cheaper.

LITHARGE.—10 cwt.-1 ton, £34 15s. per ton.

MAGNESITE.—Calcined, in bags, ex works, about £9 to £10 per ton.

MAGNESIUM CHLORIDE.—Solid (ex wharf), £10 per ton.

*MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY PRODUCTS.—Controlled prices for 1 cwt. quantities: Bichloride powder, 7s. 5d.; bichloride lump, 8s.; bichloride ammon. powder, 8s. 11d.; bichloride ammon. lump, 8s. 9d.; mercurous chloride, 8s. 11d.; mercury oxide, red cryst., B.P., 10s. 3d.; red levig. B.P., 9s. 9d.; yellow levig. B.P., 9s. 7d.

*METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities.

*NITRIC ACID.—Spot, £25 to £30 per ton, according to strength, quantity and destination.

OXALIC ACID.—£48 5s. per ton for ton lots, ex wharf, in casks, smaller parcels, 53s. to 57s. per cwt., ex store; deliveries slow.

*PARAFFIN WAX.—GLASGOW: 3½d. per lb.

POTASH, CAUSTIC.—Liquid, £25 to £30 per ton.

POTASSIUM BICHROMATE.—5½d. per lb. carriage paid. GLASGOW: 5½d. per lb., carriage paid.

POTASSIUM CHLORATE.—Imported powder and crystals, ex store London, 10d. to 1s. per lb.

POTASSIUM IODIDE.—B.P., 9s. 10½d. per lb. in 7 lb. lots; for not less than 1 cwt., 7s. 9d. per lb.

POTASSIUM NITRATE.—Small granular crystals, £26 to £29 per ton ex store, according to quantity.

POTASSIUM PERMANGANATE.—B.P. 1s. 3½d. per lb.; commercial, 143s. per cwt., d/d.

POTASSIUM PRUSSATE.—Yellow, about 1s. 8d. per lb., supplies scarce.

SALAMMONIAC.—Dog-tooth crystals, £42 per ton; medium, £38; fine white crystals, £16; in casks, ex store.

SALT CAKE.—Unground, spot, £3 15s. per ton.

SODA ASH.—Light 98/100%, £5 17s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 10s. per ton d/d station.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£25 to £26 per ton, ex wharf.

SODIUM BICARBONATE.—About £10 10s. per ton, in bags.

SODIUM BICHROMATE.—Crystals, 4½d. per lb., net d/d U.K. with rebates for contracts. GLASGOW: 4½d. per lb., carriage paid.

SODIUM BISULPHITE POWDER.—60/62%. £12 10s. to £14 per ton d/d in 2-ton lots for home trade.

SODIUM CARBONATE MONOHYDRATE.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

SODIUM CHLORATE.—£27 10s. to £32 per ton, d/d according to quantity.

SODIUM HYPOSULPHITE.—Pea crystals, £15 15s. per ton for 2-ton lots; commercial, £11 15s. per ton. MANCHESTER: Commercial, £11 10s.; photographic, £16.

*SODIUM METASILICATE.—£14 5s. per ton, d/d U.K. in cwt. bags.

SODIUM NITRATE.—Refined, £8 5s. per ton for 6-ton lots d/d.

SODIUM NITRITE.—£18 5s. per ton for ton lots.

SODIUM PERBORATE.—10%, £4 per cwt. d/d in 1-cwt. drums.

SODIUM PHOSPHATE.—Di-sodium, £16 to £17 per ton delivered for ton lots. Tri-sodium, £18 per ton delivered per ton lots.

SODIUM PRUSSATE.—4½d. to 5½d. per lb.

SODIUM SILICATE.—£8 2s. 6d. per ton.

*SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.

*SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. MANCHESTER: £3 15s.

SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £13; crystals, £9 15s.

*SODIUM SULPHITE.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.

*SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

TARTARIC ACID.—1s. 2½d. per lb., less 5%, carriage paid for lots of 5 cwt. and upwards. Makers' prices nominal; imported material 2s. 3d. to 2s. 6d. per lb., ex wharf. MANCHESTER: 1s. 3½d. per lb.

ZINC OXIDE.—Maximum prices: White seal, £30 17s. 6d. per ton; red seal, £28 7s. 6d. d/d; green seal, £29 17s. 6d. d/d buyers' premises.

ZINC SULPHATE.—Tech., about £19 10s., carriage paid, casks free.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 9½d. to 1s. 6d. per lb., according to quality. Crimson, 1s. 7½d. to 1s. 10½d. per lb.

ARSENIC SULPHIDE.—Yellow, 1s. 6d. to 1s. 8d. per lb.

CARBON DISULPHIDE.—£25 to £30 per ton, according to quantity, in free returnable drums.

CARBON TETRACHLORIDE.—£48 to £53 per ton, according to quantity, drums extra.

CHROMIUM OXIDE.—Green, 1s. 3d. per lb.

INDIA-RUBBER SUBSTITUTES.—White, 5½d. to 6½d. per lb.; dark 5½d. to 6d. per lb.

LITHOPONE.—30%, £16 15s. per ton.

SULPHUR CHLORIDE.—6d. to 8d. per lb., according to quantity.

VEGETABLE BLACK.—£35 per ton upwards; 28/30%, £15 10s. 0d.; 60%, £29, delivered buyers' premises.

ZINC SULPHIDE.—About £63 per ton ex works. Plus 5% War Charge.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—£7 17s. 6d. per ton in 6-ton lots, d/d farmer's nearest station.

CALCIUM CYANAMIDE.—£12 10s. for 5-ton lots per ton net f.o.r. or ex store, London. Supplies small.

NITRO-CHALK.—£7 14s. per ton, in 6-ton lots, d/d farmer's nearest station.

CONCENTRATED COMPLETE FERTILISERS.—£11 18s. to £12 4s. per ton in 6-ton lots, d/d farmer's nearest station.

AMMONIUM PHOSPHATE FERTILISERS.—£11 14s. to £16 6s. per ton in 6-ton lots, d/d farmer's nearest station.

Coal Tar Products

+BENZOL.—At works, crude, about 1s. 0½d. per gal.; 90's, 1s. 7d. to 1s. 9d.; pure, 1s. 10d. to 2s. MANCHESTER: Crude, 1s. 0½d. per gal.; pure, 1s. 10½d. per gal.

CARBOLIC ACID.—Crystals, 10d. to 10½d. per lb.; Crude, 60's 3s. 3d. to 3s. 6d., according to specification. MANCHESTER: Crystals,

9½d. to 10½d. per lb., d/d; crude, 3s. 6d. to 3s. 9d.; naked, at works.

CREOSOTE.—Home trade, 5½d. per gal., f.o.r., makers' works; exports 6d. to 6½d. per gal., according to grade. MANCHESTER: 4½d. to 6½d.

CRESYLIC ACID.—99/100%, 2s. 9d. to 3s. 3d. per gal., according to specification. MANCHESTER: Pale, 99/100%, 3s.

NAPHTHA.—Solvent, 90/160°, 1s. 8d. to 1s. 9d. per gal.; solvent, 95/160°, 1s. 10d. to 1s. 11d., naked at works; heavy, 90/190°, 1s. 4d. to 1s. 5d. per gal., naked at works, according to quantity. MANCHESTER: 90/160°, 1s. 6½d. to 1s. 9d. per gal.

NAPHTHALENE.—Crude, whizzed or hot pressed, £8 15s. to £10 15s. per ton; purified crystals, £16 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £4 10s. per ton. MANCHESTER: Refined, £17 to £18.

PITCH.—Medium, soft, 32s. 6d. per ton, f.o.b. MANCHESTER: 37s. 6d., f.o.b. East Coast.

PYRIDINE.—90/140°, 17s. to 18s. 6d. per gal.; 90/160°, 14s. to 15s.; 90/180°, 3s. to 4s. 6d. per gal., f.o.b. MANCHESTER: 15s. 6d. to 19s. per gal.

TOLUOL.—90%, 2s. 3d. per gal.; pure, 2s. 5d. to 2s. 7d., nominal. MANCHESTER: Pure, 2s. 9d. per gal., naked.

XYLOL.—Commercial, 2s. 6d. to 2s. 11d. per gal.; pure, 2s. 8d. to 3s. 2d. MANCHESTER: 2s. 8d. per gal.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £7 5s. to £8 per ton; grey, £10 to £12. MANCHESTER: Grey, £14.

METHYL ACETONE.—40.50%, £35 to £38 per ton.

WOOD CREOSOTE.—Unrefined, 1s. to 1s. 3d. per gal., according to boiling range.

WOOD NAPHTHA, MISCIBLE.—3s. 7d. to 4s. per gal.; solvent, 4s. to 4s. 6d. per gal.

WOOD TAR.—£4 to £5 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—1s. 10d. per lb., for cwt. lots, net packages.

BENZIDINE, HCl.—2s. 7d. per lb., 100% as base, in casks.

BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 11d. per lb. d/d buyer's works.

m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.

o-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.

p-CRESOL 34/35° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.

DICHLORANILINE.—2s. 1½d. to 2s. 7d. per lb.

DIMETHYLANILINE.—Spot, 1s. 7½d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROCHLOROBENZENE, SOLID.—£79 5s. per ton.

DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 11½d.

DIPHENYLAMINE.—Spot, 2s. 3d. per lb.; d/d buyer's works.

GAMMA ACID, Spot, 4s. 4½d. per lb. 100%, d/d buyer's works.

H ACID.—Spot, 2s. 7d. per lb.; 100%, d/d buyer's works.

NAPHTHIONIC ACID.—1s. 10d. per lb.

β-NAPHTHOL.—£97 per ton; flake, £94 8s. per ton.

α-NAPHTHYLAMINE.—Lumps, 1s. 1d. per lb.

β-NAPHTHYLAMINE.—Spot, 3s. per lb.; d/d buyer's works.

NEVILLE AND WINTHER'S ACID.—Spot, 3s. 3½d. per lb. 100%.

o-NITRANILINE.—4s. 3½d. per lb.

m-NITRANILINE.—Spot, 2s. 10d. per lb. d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 10d. to 2s. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5½d. per lb., in 90-gal. drums, drums extra, 1-ton lots d/d buyer's works.

NITRONAPHTHALENE.—10d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.

SULPHANILIC ACID.—Spot, 8½d. per lb. 100%, d/d buyer's works.

o-TOLUIDINE.—11d. per lb., in 8/10 cwt. drums, drums extra.

p-TOLUIDINE.—2s. per lb., in casks.

m-XYLIDINE ACETATE.—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON, Dec. 16.—To Dec. 31 (per ton, net, naked, ex works, mill or refinery, and subject to additional charges as to package and location of supplies).—LINSEED OIL, raw, £36 10s. RAPESEED OIL, crude, £44 5s. COTTONSEED OIL, crude, £26; washed, £28 15s.; refined edible, £29 12s. 6d.; refined deodorised, £30 10s. SOYA BEAN OIL, crude, £27; refined deodorised, £31. COCONUT OIL, crude, £22 2s. 6d.; refined deodorised, £25 7s. 6d. PALM KERNEL OIL, crude, £21 10s.; refined deodorised, £24 15s. PALM OIL, refined deodorised, £27. GROUNDNUT OIL, crude, £29 10s.; refined deodorised, £34. WHALE OIL, crude, hardened 42 deg., £24 10s.; refined hardened 42 deg., £27. ACID OILS.—Groundnut, £20; soya, £18; coconut and palm kernel, £18 10s. Non-controlled commodities were nominally unaltered. ROSIN, 25s. to 35s. per cwt., according to grade. TURPENTINE, 59s. 6d. per cwt. spot, American, ex wharf, barrels, including tax and ex discount.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BENZOL AND BY-PRODUCTS, LTD., London, E.C. (M., 23/12/39.) Nov. 24, debenture supplemental to debenture dated June 4, 1937, securing £15,000, making with the sum of £10,000 outstanding under said debenture £25,000, to H. Hodson, Padham; general charge (except railway waggons and tank waggons). *£10,000. March 15, 1939.

YORKSHIRE CASEIN MANUFACTURERS, LTD., Manchester. (M., 23/12/39.) Dec. 11, £650 charge, to P. Stevenson, Liverpool, and another, charged on land and buildings at Bank Street, and White Horse Yard, Wakefield. *—, Feb. 1, 1939.

Satisfaction

I.C.I. (FERTILIZER AND SYNTHETIC PRODUCTS), LTD., Slough. (M.S., 23/12/39.) Satisfaction December 12 of charge registered December 20, 1935.

Companies Winding-Up Voluntarily

DENT'S CELLULOSE, LTD., Marske-by-the-Sea. (C.W.U.V., 23/12/39.) Dec. 9. C. Gildon, 48 Albert Road, Middlesbrough, liquidator.

Receiverships

E. L. AND C. B. PRICE AND CO., LTD., London, S.W., oil, colour and varnish merchants. (R., 23/12/39.) F. C. Rossiter, 56 Moorgate, E.C. Dec. 13.

ROBINSON, NELSON AND CO., LTD. (R., 23/12/39.) H. F. Holloway, of Bentinck Buildings, Wheeler Gate, Nottingham, was appointed receiver on December 4, 1939, under powers contained in debentures dated August 11, 1932, February 28, 1936, and October 18, 1937.

Company News

Lever Brothers and Unilever N.V., have declared the half-yearly dividends on the six per cent. cumulative preference shares and on the seven per cent. cumulative preference shares.

British Coal Distillation, Ltd., report for the year to May 31 a net loss of £8,309 (£19,242 for the previous eighteen months). The credit balance on profit and loss is reduced from £15,164 to £7,854.

English Clays, Lovering and Pochin and Co., Ltd., report a profit of £104,869 in the year to September 30, 1939, compared with £101,869 in the previous twelve months. The ordinary dividend is increased from 2 per cent. to 2½ per cent.

New Companies Registered

Marchon Products, Ltd. (358,061).—Private company. Capital £1,000 in 1,000 shares of £1 each. To carry on the business of merchants, dealers in and importers, exporters and manufacturers of chemicals, chemists' sundries, etc. Subscribers: Lionel Morrish, Martha Tablin. Secretary: L. Morrish. Registered office: 118 Fenchurch Street, E.C.3.

Biochemical Processes, Ltd. (357,821).—Private company. Capital, £2,500 in 2,000 ordinary shares of £1 each, and 10,000 founders' shares of 1s. each. To acquire any patents and to carry on the business of producers and refiners of all kinds of oils and fats, tallow and dripping manufacturers and merchants, bone boilers and merchants, etc. Directors: Sir Paul Duke, K.B.E., Henry E. White, F.S.A.A. Registered office: 14 Clarges Street, W.1.

Herbert Grange and Company, Ltd. (357,829).—Private company. Capital, £3,000 in 2,000 6 per cent. cumulative preference shares of £1 each, 9,500 "A" ordinary and 500 "B" ordinary shares of 2s. each. To carry on the business of manufacturers of and dealers in animal feeding stuffs and prepared foods, animal medicines, fertilisers, manures, etc. Directors: Philip E. Symons (governing director), Fredk. H. Grange. Registered office: Station Approach, Pulborough, Sussex.

British Luminescent Powder Laboratories, Ltd. (357,611).—Private company. Capital, £100 in 100 shares of £1 each. To carry on the business of manufacturers of and dealers in luminescent, fluorescent and all kinds of powders, paints, cosmetics, varnishes, japans, enamels, lacquers, oils and other chemical resins, tars, oils, printing and other inks, dyes, chemicals, tar, gums and oil products, lamp and electric lamp bulbs, signwriters, etc. The subscribers (each with one share) are: H. F. Perry, 8 Park Grove Road, Leytonstone, E.11; W. H. Butterfield. Solicitors: Sweepstone & Co., Broad Street House, E.C.2.

Rhythm-Izer, Ltd. (358,091).—Private company. Capital £1,000 in 1,000 shares of £1 each. To carry on the business of storers, manufacturers, distributors, producers, distillers and importers of and dealers in oils, lubricants, greases, tallow, paraffin, benzol, motor spirits, tar, bitumen, petroleum, wax, beeswax, oil and other fuels, disinfectants, fertilisers, chemicals, cleaners and polishers, etc. Directors: Lt. Henry E. B. Gundry, Frank G. Carter, Mrs. Rosemary A. Gundry, and Miss Kathleen A. Throssel, all of Grange, Honiton. Solicitors: Tweed and Son, Honiton, Devon.

Chemical and Allied Stocks and Shares

ALTHOUGH holiday influences further reduced the volume of business in the industrial and other sections of the Stock Exchange, the market undertone remained steady, and there were individual features of interest among shares of chemical and kindred companies. B. Laporte have been marked up from 57s. 6d. to 60s. and Borax Consolidated deferred remained steady at 25s. 3d., but Imperial Chemical ordinary and preference were moderately lower at 29s. 6d. and 31s. respectively. Fison Packard have been marked down to 35s., but there was some buying of Imperial Smelting, which were 1s. better at 11s. 6d., sentiment being influenced by the market view that there seem reasonable prospects of a resumption of dividends with a small payment in 1940. Lever and Unilever improved to 31s. 6d., and British Oil and Cake Mills preferred were firm at 39s. 3d., while Crosfields Oil and Cake and United Premier Oil and Cake ordinary shares transferred at higher prices. There was a fair amount of activity in Thomas De La Rue ordinary on the market view that the plastics side of the business is probably showing an upward trend in earnings. Greiff-Chemicals Holdings 5s. units continued around par, while Monsanto Chemicals 5½ per cent. preference were unchanged at 21s. 3d.

Turner and Newall have declined to 65s. 9d. on the preliminary figures for the past year's working, but British Oxygen were steady around 71s. 3d., and British Aluminium at 50s. 3d. were quite well maintained on balance. General Refractories were firmer around 9s. 9d., while Barry and Staines improved to 23s. 9d. The results and initial dividend of the Lancashire Cotton Corporation tended to increase interest in textile shares, and higher prices were made by Bradford Dyers, Calico Printers and British Cotton and Wool Dyers. Rayon shares maintained recent gains fairly

well, and better demand was reported for British Celanese second preference. Only small movements were shown in Stewarts and Lloyds and other iron, steel and kindred shares. Babcock and Wilcox, however, were higher at 41s. 3d. and Birmid Industries were 59s. Ilford ordinary shares transferred at 22s. 6d. Dunlop Rubber were fairly active around 30s. aided by the more encouraging views of dividend prospects which remain current in the market. Triplex Glass were 20s. 3d., Canning Town Glass 4s. 6d. and United Glass Bottle changed hands at 47s.

Pinchin Johnson were lower at 18s. and International Paint also moved against holders, but Lewis Berger improved, and Wall Paper deferred remained around 15s. 6d. Boots Drug were 39s. 6d., and Timothy Whites 22s. 6d., while Sangers were steady at 20s. 3d., aided by the maintenance of the interim dividend. On the other hand, British Match moved down to 31s. 6d., and Swedish Match were 11s. 3d. United Molasses have moved up from 25s. 4½d. to 26s., while British Glues 4s. ordinary shares were 6d. better at 5s. 10½d. Erinoid were slightly more active around 3s. 6d. Distillers benefited from the good impression created by the interim dividend, and on balance have risen from 64s. to 66s. 3d. Valor ordinary put on 7½d. and were quoted at 20s.

There was a better tendency in oil shares, which attracted rather more attention following their recent reaction. As compared with a week ago "Shell" have rallied from 78s. 9d. to 81s. 3d. and Anglo-Iranian from 51s. 3d. to 53s. 9d., while Burmah Oil were 1s. 3d. better at 61s. 3d. Lobitos were steady at 38s. 1½d., awaiting declaration of the interim dividend.

